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TABLE OF CONTENTS

		PAGE
519	Statistics*	1
575	Breeding*	4
575.1	Genetics*	29
575.2	Variations, Modifications, Mutations	35
575.4	Selection	37
576.1	Origin of Species	37
576.3	Cytology*	39
58	Botany*	43
632	Diseases and Injuries, Bacteria, Fungi*	46
633	Economic Plants	51
633.1	Cereals	53
633.11	Wheat	55
633.13	Oats	67
633.14	Rye	68
633.15	Maize	69
633.16	Barley	72
633.17	Millets and Sorghum	74
633.18	Rice	74
633.2	Forage Grasses	77
633.3	Leguminous Forage Plants	81
633.4	Roots and Tubers	86
633.5	Fibres	99
633.6	Sugar Plants	112
633.7	Stimulants	120
633.8	Aromatic Plants	125
633.85	Oil Plants	126
633.88	Medicinal Plants	131
633.91	Rubber Plants	132
634	Fruits and Nuts	133
634.9	Forestry	148
635	Vegetables	156
	Book Reviews	175
	New Journals	185

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* General studies, see also individual crops.

Plant Breeding Abstracts

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*STATISTICS 519

1. AZIZUDDIN AHMAD SIDDIQI 519.24
A new method of obtaining squares of numbers.
Curr. Sci. 1947 : **16** : 178–79.

A simple mental method is given for obtaining the squares of numbers containing any number of digits.

2. JAMES, E. 519.24
A modification of the formulae for regression.
J. Amer. Soc. Agron. 1947 : **39** : 545–46.

A method is described for working out regression coefficients when the class intervals of the X observations differ from those of the Y observations.

3. YATES, F. 519.24
Technique of the analysis of variance.
Nature, Lond. 1947 : **160** : 472–73.

Disagreement is expressed with Vajda's remarks on the analysis of variance technique appropriate to 2-way tables with unequal frequencies in the different subclasses. It is shown under what circumstances proportionate frequencies may be legitimately employed.

4. BLISS, C. I. 519.24:631.421
2 × 2 factorial experiments in incomplete groups for use in biological assays.
Biometrics 1947 : **3** : 69–88.

The design and analysis of 2 × 2 factorial experiments involving incomplete groups of two or three units is discussed with examples.

5. KISHEN, K. 519.24:631.421
On fractional replication of the general symmetrical factorial design.
Curr. Sci. 1947 : **16** : 138–39.

The theory of fractional replication of factorial designs due to Finney is extended to cover the general symmetrical factorial arrangement S^m, where $S = P^n$, P being a prime positive integer and n any positive integer. Use is made of the paper by Bose and Kishen on the geometrical theory of confounding.

6. MARTINS, R. G. 519.24:631.421
Experimentação agrícola. (**Agricultural experimentation**).
Bol. Minist. Agric. Rio de J. 1945 : **34** : 1–14.

The application of the analysis of variance to random block and Latin square designs is outlined.

7. MENDONÇA, P. DE VARENNES E 519.24:631.421
Ortogonalidade e análise de variância. (**Orthogonality and analysis of variance**).
An. Inst. Sup. Agron. Lisboa 1942 : **13** : 15–37.

After presenting some theorems on orthogonality, the author applies the analysis of variance to randomized blocks.

8. NISSEN, Ø. 519.24:631.421
Om nabovirkning i rotvekstforsøkene. (**The interaction between neighbouring plots in root experiments**).
Meld. Norg. LandbrHøgs. 1947 : **27** : 155–64.

It has been shown that vigorously growing varieties of root crops may depress the yield of adjacent varieties with lower yields in field trials. This interaction may be remedied

* General studies, see also individual crops.

by using border plots, or more economically, by arranging the varieties in order of leaf productivity, this being determined in a preliminary trial.

9. SUKHATME, P. V. 519.24:631.421
Use of small-size plots in yield surveys.
Nature, Lond. 1947 : **160** : p. 542.

Rectangular sample plots of 1/80 acre are recommended for crop yield surveys. The over-estimation of yield which has resulted from the use of smaller plots is attributed to the inclusion of border plants within the plots; the addition of a single plant may easily bias estimation when the plots are small.

10. LAAN, E. VAN DER 519.24:631.421:061.6(49.2)
Mededeelingen van den Studiekring voor Proeftechniek. (**Proceedings of the Study Circle for Experimental Methods**).
Landbouwk. Tijdschr. Wageningen 1943 : **55** : p. 621.

At the fifth conference, at Utrecht on 19 November, 1942, papers were read by E. van der Laan on the "Arithmetical calculation of experimental results by Fisher's method"; and by Dr O. Banga on the "Application of the analysis of variance in the study of varieties". These were followed by a short consideration of analysis of degrees of freedom in combinations of experiments by S. J. Wellensiek.

The first two papers were published in the *Mededeelingen van den Tuinbouwvoorlichtingsdienst* 1943" and are therefore not on sale. A few copies of the other are still available.

The 6th and 7th conferences were devoted to "Correlation" and the papers read by M. van Uven and A. E. H. R. Boonstra follow in full.

The 8th conference was held on 21 October at Utrecht. Both the papers read by A.Franke and J. J. Post were on uniformity trials and will be published as soon as circumstances permit in the *Landbouwkundig Tijdschrift* (cf. Absts 12–14). C. B.

11. 519.24:631.421:633:575(54)
Symposium on statistical methods in plant and animal breeding.
Proc. Indian Acad. Sci. 1947 : **25** : Sect. B : 126–54.

Panse, V. G.

Statistics is a valuable tool for estimating the genetic component of general variability. In breeding work with cotton, although a high degree of variability is useful, high progeny means are preferred. It is possible to select in the F_1 if progeny mean values for any particular character are high.

Improvements in the technique of selection have been obtained by substituting progeny row breeding for mass selection. The discriminant function has also been used for selection, but its value is somewhat uncertain.

Replicated progeny row trials each season are recommended for guarding against deterioration in the seed stocks of varieties.

It is pointed out that plant characters of economic importance are usually determined by quantitative genes, to which more attention should be paid.

Sukhatme, P. V.

Animal breeding in India has not yet made much use of statistical methods. A goat breeding experiment did not produce the improvements hoped for. In the future, however, more success is anticipated.

Kishen, K.

The discriminant function is useful in making a preliminary selection of genetic material. Incomplete block designs assist in selection when the number of lines under investigation is large.

Thawani, V. D.

Some of the assumptions underlying the discriminant function are queried, in particular the assumption that the genotypic and phenotypic components of variance may be combined additively.

Bokil, S. O.
The relationship between heterosis, and the F_2 and F_3 variance of quantitative characters is analysed, assuming (1) that each character is determined by a large number of independent factors, each having a small effect only, (2) that the factors are not related epistatically, and (3) that every factor exerts an equal effect on any particular character.

Koshal, R. S.
F_1 selection of hybrids may be effected by growing the hybrids in randomized blocks together with their parents, and analysing for simple genetic determination, heterosis and epistasis.

Sahasrabudhe, V. B.
Randomized blocks have, in general, been found more efficient than strips with controls, compact blocks with controls, or incomplete block designs. The latter proved more efficient only when large numbers of varieties were being compared, but it is doubted whether the extra labour involved in their lay-out and subsequent analysis is worth while.

Ramdas, L. A.
A technique for testing for drought resistance in the laboratory is outlined.

Darain, R. D.
The application of the discriminant function to intelligence testing is explained.

Ranjan, S.
More attention should be paid to the nutritional value of new improved varieties.

Chandrasekar, C.
It is doubtful to what extent genes may be regarded as uniformly distributed in human populations.

Madhava, K. B.
Pure mathematics has lagged behind in providing rigorously worked out and complete solutions for many of the equations derived from the statistical analysis of biological material.

Pendharkar, V. G.
Further consideration is given to the goat breeding project mentioned above. Using the experience gained from this experiment, future work should prove more profitable.

Sen, A. R.
The statistical methods available for detecting and analysing linkage are surveyed.

Ramiah, K.
Summing up the contributions of the earlier speakers, special emphasis is laid on the need for the closest collaboration between plant breeders and statisticians.

12. Erlee, T. J. D. 519.24:631.421:633.61(92.2)
Twee problemen op het gebied van de variatie-statistiek, bestudeerd op basis van de uitkomsten van de 203 in het jaar 1931 op Java geoogste blanco suikerrietvakkenproeven. (**Two problems in statistical variation based on 203 blank experiments, harvested in 1931, on sugar cane in Java**).
Landbouwk. Tijdschr. Wageningen 1943 : **55** : 660–68.

Of 217 blank experiments, distributed over the sugar-growing districts of Java, and laid out shortly before the harvest, in 2878 POJ, in normal plantations, 203 were suitable for this study. Each experiment was divided into 36 equal-sized plots, but the areas of the experiments varied from $\frac{1}{2}$ to 3 ha. ($1\frac{1}{4}$ to $7\frac{1}{2}$ acres), with an average of 0·84 ha. (2·1 acres). The problems studied were (1) the relationship between the yield of cane per acre and its standard deviation (2) the correlation between the yield of cane per acre and the sugar content of the cane. The author concludes that the fertility of the land has no preponderating effect on the uniformity of the crop, i.e. that there is no relationship between yield and its standard deviation, and that there is a low but significant negative correlation (— 0·29) between yield of cane per acre and the recoverable sugar, calculated on an agreed basis from the soluble dry matter content and the sugar content of the sap, and that the

so-called "compensation" (low weight of cane with high sugar content and vice versa) on the same square meter of land is merely wishful thinking on the part of the planter. The 203 coefficients of correlation calculated for individual experiments show a range from — 0·9 to + 0·6, which the author considers may represent two populations with means — 0·45 and zero respectively. He draws attention to the coincidence that the correlation calculated for beet sugar between weight of beet and sugar content is also — 0·29. C. B.

13. BOONSTRA, A. E. H. R. 519.241.1:633.00.14
Correlatie in de praktijk. (**Correlation in practice**).
Landbouwk. Tijdschr. Wageningen 1943 : **55** : 639–59.

The author points out that the purpose of the Dutch Study Circle for Experimental Methods is not to study mathematical questions as such, but to study the application of mathematical results to the solution of various agricultural problems. This he does with a series of results from actual experiments on (1) potatoes: correlation between the number of haulms and tuber yield; (2) beet: correlation between refractive index of beet sap and dry matter content; (3) potatoes: correlation between observations at different times on the same plant; (4) beet: correlation between foliage weight in June and yield in September; (5) beet: correlation between weight of dead leaves, their ash content and yield of sugar; (6) beet: correlation between dry matter of beet, dry matter of leaf, ash content of leaf and number of leaves.

A warning is given about correlation based on few observations, e.g. if there are only 10, then the number of degrees of freedom does not permit the calculation of correlation coefficients between more than 10 varieties, as in this case and is automatically equal to 1. C. B.

14. UVEN, M. J. VAN 519.241.1:633.00.14
Correlatie I. (**Correlation I**).
Landbouwk. Tijdschr. Wageningen 1943 : **55** : 622–29.

UVEN, M. J. VAN
Correlatie II. (**Correlation II**).
Ibid. 1943 : **55** : 630–38.

These papers are purely mathematical considerations of the theory of correlation. C. B.

*BREEDING 575

15. MOYER, R. T. 575(51)
China's agricultural-improvement program.
Foreign Agric. U.S. Dep. Agric. 1947 : **11** : 130–40.

Plant breeding work in China is briefly reviewed.

16. 575:633
Société d'encouragement de la culture des orges de brasserie et des houblons en France, Secobrah. Rapports sur la campagne 1944. (**Society for encouraging the cultivation of malting barley and hops in France, Secobrah. Report for 1944**).
Paris 1944 : Pp. 74.

Barley

It is reported that the collections of winter and spring barley were sown as usual at Maule in 1943 and 1944 respectively, and seeds were obtained from several crosses between plants from these collections. The testing of varieties, including hybrids made in previous years, is reported, and the results set out in tables. Study of Bayard x Bethge XIII and Victoria x Bethge XIII hybrids showed that the factor for long seeds is dominant. One hybrid, Probstdorf x Sarah (60 L 3), proved to be earlier than Probstdorf, and to have a better yield and better quality grain. The winter barley Albert is interesting since it is almost as good as Damseaux for forage, and appears to be at least as good as Probstdorf in chemical composition. Among the spring varieties, Baronne x Bohemia 1 and René Guillemart

* General studies, see also individual crops.

seem to be the most commendable on the whole. The hybrid Comtesse x Bohemia 7 has especially good industrial qualities.
The effect of nitrogen manuring on different varieties is described. On the whole an increase in manuring causes an increase in yield of grain.
The results of the propagation of some spring and winter varieties are given. Two hybrids, Comtesse x Bohemia 2 and Baronne x Bohemia, gave very good yields.
An account is given of the cultivation of pure lines in different regions in 1944. The yields, in general, were not good, chiefly because of drought.

Hops
An attempt is made to classify hop varieties according to the size and shape of the bracts, and the varieties studied are divided into four groups on this basis.
With the aim of establishing a fixed standard of judgment according to which different samples of hops may be compared, a method of notation is proposed whereby a definite number of marks is allotted to each of the characters taken into account. The quality of eleven samples is assessed according to this notation.
It appears that early varieties set seed less easily because of their earlier flowering, but it is suggested that the observed variability in the amount of seed produced by different varieties may be due to the occurrence of parthenogenesis in some of them.

17. 575:633(41)

Scottish Society for Research in Plant-Breeding. Report by the Directors and Report by the Director of Research to the Annual General Meeting.
24th July, 1947 : Pp. 44.

Wheat
Introduced wheat hybrids and wheat-*Agropyron* hybrids are under observation.

Oats
Breeding work continued. Trials of 13 new hybrid selections were carried out, the variety Star being used as the control. Six selections gave yields equal to those of Star; six selections were earlier in ripening, and ten were more resistant to lodging.
Regional tests of various hybrid selections at later stages of trial are also reported. The varieties Aa 676 and Aa 708 again gave promising results, particularly as regards strength of straw and ripening period.
The results of milling tests on the following hybrid selections are given: 480(3) E(5) A, Aa 713, Aa 712, Aa 698, Aa 708 and Aa 676. All these selections were found to be suitable for milling.
The entire collection of 160 varieties has been sown for the first time since the war, with a view to studying their botanical characters and classifying the collection.
Elite stocks of Early Miller and Bell were maintained.

Barley
Elite stocks of Craigs Triumph were maintained.

Sweet lupin
German strains of sweet lupin are under investigation.

Swede and turnip
The pure line method of swede breeding, which has been practised for twelve generations of selfing, has not in itself resulted in marked improvement. Inbred pedigree lines are therefore to be crossed, to investigate the effect of intravarietal hybridization. In the meantime intervarietal hybrids are under test for their economic value.
Trials of the resistance of turnip and swede varieties to club root were continued. The Bruce, Wallace and Danish Immuna turnips yielded crops practically unaffected by the disease.
The results of the 1946–47 winter resistance trial of swede varieties and strains are reported.

Kale
Two leafy strains of marrow-stem kale from Germany were compared with two British strains designated A and B; strain A was also a leafy type. Strain A and the two German

strains showed considerable increases in leaf production over the stemmy type represented by strain B. Strain A, however, gave the higher gross yield and leaf weight.
Tests were carried out for resistance to winter conditions. In general the lower growing types suffered least, being protected by snow.

Broccoli
In trials of strains bred at the station and other strains observations were made on winter hardiness.

Phaseolus
Apparently pure lines of field beans are being multiplied for further trial. Several white-flowered plants have been observed; these are being isolated as they may prove useful for studies on inheritance.

18. 575:633(42)
575:582
633.11:575.127.2

Plant breeders' conference at Cambridge.
Nature, Lond. 1947 : **160** : 423–25.

The main trends of breeding work in progress at the Cambridge Plant Breeding Institute, and its recent achievements in the production of new cereal and forage plant varieties are described. The work of the Horticultural Research Station and the National Institute of Agricultural Botany is also referred to. A brief account is given of the breeding of blight immune potatoes at Cambridge, and the hybridization and production of polyploids by colchicine treatment in wheat.
The discussions of the conference on phylogenetic and taxonomic investigations in relation to plant breeding and on living collections of crop plants and their relatives are reported.

19. Bonvicini, M. 575:633(45)
Nuove attività genetiche dell'Istituto di Allevamento Vegetale di Bologna.
(Recent genetic activities of the Bologna Plant Breeding Institute).
Ital. Agric. 1941 : **78** : 369–82.

An account is given of the breeding work with cereals carried out at the institute in the period 1935 to 1940. In wheat the objectives have been to combine high yield, earliness, resistance to frost and disease, rust in particular, standing capacity, and high grain quality. Some of the hybrids under examination come very near to achieving these objectives.
In rice, in addition to the usual objectives of increasing yield, standing capacity, earliness and disease resistance, special attention has been given to the production of varieties with fine quality grain capable of giving satisfactory yields. The variety Settantasette [Seventy-seven], a hybrid from Lady Wright x Greppi, combines the above characters and is to be introduced into cultivation. Several other new varieties, superior in one respect or another, have been produced and are being released.
Maize breeding has consisted of purifying the genetical constitution of the existing material and has resulted in the production of two very early dwarf varieties and one medium early, all notably superior for cultivation on unirrigated land. They have cylindrical cobs, a character apparently derived by hybridization from a form of *Zea everta*.
Other products of the institute include the six-row barleys Ventitrè [Twenty-three], extremely early and high yielding, and Venticinque [Twenty-five], very productive and resistant to lodging, two very early maturing two-row malting barleys, some exceedingly early naked barleys selected from Abyssinian forms, some superior early maturing oat varieties, a promising hardy, early maturing and strong growing rye variety produced by crossing a local form with a Croatian rye, and several selections of forage sorghum differing in time of maturity; the latter include several giant forms.
The tomato variety Ladino di Panocchia, extensively cultivated in the Parma region, has proved on examination to be very heterogeneous as regards such characters as vigour, earliness, disease resistance and fruit type. Certain definitely superior types have been observed and selected. One of the best is the variety Quindici [Fifteen], very early and productive; two others which are selections from natural crosses of Ladino di Panocchia x

Pierrette, are Ventuno [Twenty-one] and Trentanove [Thirty-nine], both early, vigorous and very high in yield. Further selections are under observation and a number of artificial crosses have been made.

Studies on the Parma onion have revealed a similar heterogeneity as regards length of dormancy, ease of removal of the scales, etc., and some superior types have been selected.

The Jesi cauliflower has also been the object of investigation, and by careful selection followed by artificial self-pollination one very much improved strain has been isolated, surpassing the unselected form in vigour of growth and characters of the inflorescence such as size, colour, shape, smooth surface and freedom from protuberances.

The flax varieties in cultivation such as Dutch Blue, Dutch White and Riga Blue, have proved to be very mixed too, apparently owing to out-crossing, and their properties have been much improved by selection. Artificial crossing is also being practised, one of the objects being if possible to produce a dual-purpose form.

20. KUZJMIN, V. P. 575:633(47)

(Experiment in selection of varieties for the Akmolinsk steppe).

Selekcija i Semenovodstvo (Breeding and Seed Growing) **1946 : 13** : Nos 4–5 : 25–34.

The climatic conditions in the Akmolinsk steppe in northern Kazahstan are very variable, and the first requirement in a successful variety is that it should be capable of tolerating considerable climatic variation; it must possess resistance to frost, heat, drought and wind, as far as possible in all developmental phases. Yield figures over the last ten years have shown the Omsk varieties Smena and Milturum 321 to be the best adapted of the spring wheat varieties; the former ears in 58 days and ripens in 90 days, the latter in 68 and 97 days respectively; in spite of its greater earliness, Smena has equalled Milturum 321 in average yield. Certain newer varieties produced by the breeding station have the capacity of reacting very strongly to brief periods of favourable weather conditions, and hence give higher yields than either of these older varieties; one of them is Akmolinka 1, which in normal years yielded 24·1 c. per ha. as against 18·3 for Smena and 19·4 for Milturum 321; in drought years the yields were 11·3, 8·1 and 7·9 c. respectively. Akmolinka 1 is characterized also by an exceedingly deep root system. Other factors affecting yield are the capacity to retain the grain in the ear during strong wind storms; this is greatest in varieties with thin, straight ears and short, thick erect stems.

Triticum durum is less suited to the conditions in question than the soft wheats, mainly owing to its slower rate of establishment in the spring. Forms with rapid early establishment have been selected from the north Kazahstan forms of Kubanka and Beloturka, and these, named Akmolinka 2 and Akmolinka 5 respectively, have outyielded the previously cultivated hard wheats by 2–4 c. per ha. (20–30%).

In millet, varieties with more compact panicles are required, to resist grain shedding in storms; one such variety, Zarja, has been produced by selection from natural hybrids between forage millet and the local early, branched form; it has given a 20% greater yield than the standard.

A cold and drought resistant buckwheat, Kazahša, has been selected, which has given yields varying from 4 to 32 c. per ha. according to season.

Early and late flowering pea selections have proved almost equal in yield. No upright form suitable for mechanical harvesting has been obtained so far, but this has been achieved in *Cicer arietinum*, by selection from a Czechoslavakian form, whereby an average yield of 22 c. per ha. was obtained in the period 1940–44.

Breeding work with lucerne has just started; hybrid lucerne of the North Caucasian ecotype has given the highest seed production.

An early selection of the Early Rose potato, maturing 12 days sooner than the parent form, has given greatly improved yields and a healthier crop. Other improved forms, Stepnjak and Bogarnyi, have given yield increases of 35–53% over Early Rose and Epicure; both are highly tolerant of drought.

A study of a number of varieties of winter rye showed that those with the least autumn growth gave the best spring growth, and this relationship is being used in breeding work. The variety Zima represents a great advance in grain size and uniformity.

21. PESOLA, V. A. 575:633(47.1)
Växtförädlingsverksamheten i Finland. (**Plant breeding work in Finland**).
Lantmannen 1947 : **31** : 542–44.

The origin, situation and staffing of the two plant breeding institutes of Finland, one at Tammisto, owned by the Centralandelslaget Hankkija, and the government institute at Jokioinen are described. Plant breeding work follows pretty closely the well known methods at Svalöf and Weibullsholm. Details of the actual system followed at Tammisto and Jokioinen are given. The production of a new variety takes from 12 to 15 years.
New Finnish cereals, many of which have been already mentioned in *Plant Breeding Abstracts* from other sources, are described with notes on their origins. The spring wheats Kimmo and Tammi are proving strong competitors of the varieties Hopea and Sopu, while Kärn is a promising competitor of the Diamant varieties.
The black-grained Simo oat, a product of the Jokioinen Institute, has become popular as a fodder oat in Finland because of its stiff straw and hardiness.
The Finnish barleys well received by the Finnish grower include: Helmi and Tammi from Tammisto; and Vankkuri, a two-rowed line from Jokioinen derived from a Canadian barley; intended for southern Finland, it gives a very high yield of groats and fodder.
Varieties produced by Finnish breeders and released in 1935 have included improved field peas; the green culinary pea Koivisto, noted for its flavour and cooking quality; the forage pea Artturi, from (Marbled Glaenö x a Finnish forage pea) x Finnish forage pea; the early green Kaleva pea, released in 1937; the vigorous, late, high yielding Sinikka pea, from Concordia x Gyllen, released in 1939, and its sister variety Paula, released in 1941, also a green pea, but ripening a week earlier than Sinikka; and the white variety Ilo, from Gyllen x Early Market, released in 1943. These varieties are each adapted to various parts of the country. The Ilo variety is intended to replace the most commonly grown Torsdag II, in those regions where every effort is being made to increase production of white peas, and where culinary peas and oats are to be cultivated together, as is done with forage peas. The same combination is contemplated in the cultivation of Sinikka.
Among the herbage plants bred at Jokioinen and for sale are the timothy strain Phl 3 and the meadow fescue Fe 1.
Breeding of potatoes, textile and oil plants is in progress and polyploidization, overwintering capacity, baking quality of wheat, drought resistance, and breeding technique, especially with reference to clover, are also included in the crop improvement programme.

22. 575:633(48.5)
Möjligheterna stora för fortsatta framsteg. En intervju med professor Å. Åkerman. (**Great possibilities for future progress. An interview with Professor Å. Åkerman**).
Lantmannen 1947 : **31** : p. 745.

Å. Åkerman 60 år. (**Å. Åkerman's 60th birthday**).
Ibid. 1947 : **31** : 753–54.

Professor Åkerman records how he became interested in plant breeding, the progress that has been made in Swedish plant breeding, his opinion about its future prospects, and the importance of contacts with foreign plant breeders.
Observations at Svalöf on old land varieties have shown that the crop improvement achieved by plant breeding represents a profit of at least 100 million kronor.
The second paper is an appreciation of Prof. Åkerman's well known contributions to the practice and science of plant breeding.

23. 575:633(49.2)
Algemeene veredelingsdag van het instituut voor de veredeling van tuinbouwgewassen. (**General breeders' day at the Institute for breeding horticultural plants**).
Fruitteelt 1946 : **36** : p. 281.

The appointment in Holland of Dr Banga in 1935 as horticultural adviser was the signal for a systematic attack on the problem of breeding horticultural crops, and this work

was established on a much broader basis when the institute came into being in 1943. The purpose of the institute, under a committee of practical growers, is not only pure breeding work, but also the examination of varieties submitted for inclusion in the register of varieties.

A special commission is to consider the legal position under which the breeder at present has a complete monopoly of a variety recorded in the horticultural register. Varieties inscribed in the agricultural register, however, may be multiplied by anyone upon payment of a royalty via the inspectorate to the breeder. C. B.

24. LAROSE, E. 575:633(49.3)
La Station de Recherches de l'Etat pour l'Amélioration des Plantes, à Gembloux. (**The State Research Station for the Improvement of Plants at Gembloux**).
Ann. Gembl. **1947** : **53** : 126–32.

The crops dealt with by the station since its creation in 1913 are enumerated, the methods employed are described, and an account is given of some of the results obtained, including the names of new varieties of cereals and flax produced.

25. KOBLET, R. 575:633(49.4)
Bericht über die Tätigkeit der Eidg. landwirtschaftlichen Versuchsanstalt Zürich-Oerlikon für die Jahre 1942–1946. (**Report of the activities of the Federal Agricultural Research Institute Zürich-Oerlikon for the years 1942-46**).
Landw. Jb. Schweiz **1947** : **48** : 121–224.

A new research institute has been established at Reckenholz, Zürich, which is to study the breeding and cultivation of cereals and potatoes.

The following items of the report relate to plant breeding:—

Triticum

Hybridizations have been effected between winter wheat strains, as follows: Swiss varieties x Swiss, Swiss x German, Swiss x Italian, Swiss x French, French x German, and Swiss x recently bred lines. Testing of winter wheat selections is in progress.

With regard to spring wheat, resistance to black rust is one of the principal breeding objectives. Huron, introduced from America, has proved susceptible. More resistant American spring wheat varieties are now being tested.

Five lines of spelt have proved superior to Oberkulmer Rot (Oberkulm Red). Hybrids have been raised from Swiss x Swiss, Swiss x German, and Swiss x recently bred spelt lines. Little is being done with *T. dicoccum* and *T. monococcum* beyond maintaining the varietal collections.

Oats

The Danish variety Minor has proved superior under Swiss conditions, followed by Flämingsgold and Flämingstreu. Early varieties are less affected by frit fly than late; Flämingsgold is particularly useful in this connexion.

Rye

Petkus yields better than the local Swiss rye varieties, and it is also more resistant to lodging except when compared with Rothenbrunner. Crosses have been made between Petkus and Rothenbrunner. Breeding for adaptation to high altitudes continues.

Maize

Hybrid maize has now been obtained from crossing Swiss inbred lines. Local races of maize are being investigated.

Barley

French winter barley varieties have not given a better performance than the standard varieties Riniker and Strickhof. Similarly, recently introduced spring barleys have not surpassed Isaria or Kenia.

Beet

Fodder and sugar beets are being tested, most of the lines having been introduced from elsewhere.

Rape
Lembke and Janetzki are superior to the land races of western Switzerland.

Potato
Variety testing is in progress. Attention is being paid to the problem of obtaining virus-free stocks.

Flax
Introduced varieties are being tested.

Poppy
F. Hoffmann–La Roche et Co. Ag. have obtained selections yielding up to 6·8% of morphine. The capsule yield of these forms, however, is low.

Hops
Selection work and studies on disease resistance are being made by the Schweizerischer Verein für Hopfenforschung [Swiss Association for Hop Investigation] at Zürich.

Soya bean
Varieties adapted to Swiss conditions have been found but their yields are low.

26. 575:633(64)
Rapport annuel d'expérimentation 1937–1938. (**Annual report of experiments 1937-1938**).
Protectorat Républ. Française au Maroc, Rabat 1940 : 1–98.

Cereals
The reactions to manuring of different varieties of wheat and barley are recorded.

Forage plants
The yields of four different varieties of lucerne are compared. The variety d'Agouraï proved superior to the others.

Sugar beet
The yields of varieties Vilmorin B and Florimond Deprez under different conditions of cultivation are compared.

Broad bean
The reactions to manuring of two broad bean varieties are recorded.

Soya bean
The effects of inoculation with radicin on varieties O. A. C. and Jaune Géant [Giant Yellow] are compared, and seven varieties, including these two, are compared with respect to time of maturity and yield under dry cultivation and under irrigation.

27. 575:633(64)
Rapport annuel d'expérimentation 1938–1939. (**Annual report of experiments 1938-1939**).
Protectorat Républ. Française au Maroc, Rabat 1940 : 1–55.

Cereals
The effects of manuring on different varieties of wheat and barley are recorded.

Sugar beet
Further varietal tests have been made on Vilmorin B and Florimond Desprez.

28. Saunders, A. R. and
Laubscher, F. X. 575:633(68)
Field experiments at Potschefstroom.
Sci. Bull. Dep. Agric. S. Afr. 1945 : No. 246 : Pp. 57.

In addition to the breeding investigations summarized below, varietal trials of wheat, maize, sorghum for ensilage, peanut, soya bean, cowpea and common bean are reported.

Wheat
The following wheats have been used in breeding for rust resistance: 39W23, 39W62, 39W73, H44-24, Renown, C17 derived from the cross Steinwedel x *Triticum Timopheevi*, and a few Kenya wheats.

Attempts have been made to transfer the grain characters of *T. vulgare* to the genetic background of the emmer group of wheats. Only 330 segregates meriting further investigation were secured from 87 interspecific crosses; at present only 26 fully fertile lines remain, of which 18 have segregated from compound crosses involving *T. vulgare*, *T. dicoccum* and *T. Timopheevi*. This material forms a new source of disease resistance.
T. Timopheevi has exhibited susceptibility to a race of stem rust; this species and its derivatives have been the chief material used in breeding for rust resistance. It is thought that annual wheat-*Agropyron* derivatives may provide a more valuable source of disease resistance than interspecific wheat crosses, with the possible exception of *Septoria* disease.

Wheat x *Agropyron*

Hybrids involving wheat and *A. elongatum* have been studied. Annual segregates from out-crosses have been tested for rust resistance; it was observed that the degree of resistance depended very largely upon the varieties of wheat entering into the cross. Annual segregates obtained by direct hybridization are to be tested for drought resistance, with the object of obtaining material for breeding drought resistant wheats.

Maize

The new Teo-maize strain has been developed. It grows vigorously and yields well; it has yellow grain of the flint type, and is medium early in maturity.
Breeding work is in progress to produce earlier maturing types of yellow dent maize, in view of the increase in the use of maize as animal feed and the fact that the best yellow dent varieties available are too late in maturity for much of the maize producing region.

Sorghum

Hybrid selections of grain sorghum showing witchweed resistance and the non-suckering habit have unfortunately proved susceptible to bacterial leaf blight, and promising selections from crosses of a variety showing resistance to bacterial leaf blight and witchweed with non-suckering selections have exhibited susceptibility to stalk-borer attack. Selections derived from crosses between witchweed resistant strains and the Birdproof variety also succumbed to borer attack.

Forage grasses

Perennial segregates of crosses between wheat and *Agropyron elongatum* are under observation, but in view of the growth habit of *A. elongatum* and of its hybrids with wheat, it is considered to be doubtful whether progeny wholly satisfactory as perennial fodder grass will be obtained. *A. glaucum* has flowered only once in six years, and upon this occasion seven hybrid plants were secured. If this species can be induced to flower more freely, hybrids between it and wheat will be subjected to colchicine treatment for the production of fertile amphidiploids.
Two strains of "perennial" hay sorghum developed from crosses made in 1934 between Sudan grass and *Sorghum verticilliflorum* have been increased by seed production and are under observation. Both strains have survived the winter survival test for three seasons. They set seed abundantly, and are more leafy but somewhat coarser than Sudan grass. It is hoped they will prove to be useful fodder crops in the warmer regions of the Union.
A Rhodes grass strain selected in 1940 has given satisfactory results in comparative tests. It is very uniform, and more leafy than the commercial variety. The strain gives adequate yields of viable seed; but it does not possess the growth vigour and yielding capacity of other grass species which produce little or no seed.

Peanut

Hybrids of Hebbal with Rustenburg, *Arachis Nambyquarae* and Jumbo, and hybrids of Java with Rustenburg and *A. Nambyquarae* are the only crosses made during the period 1936–38 which have yielded promising selections. Virginia Bunch, the standard variety grown in the Union of South Africa, has proved to be a poor parent in crosses. Only the cross Virginia Bunch x Rustenburg has provided a few selections worth further study; these are promising hay types but valueless for seed production. The selections secured so far from the hybrids of Hebbal and Java with the above mentioned varieties possess higher

yielding capacity than Virginia Bunch, partly on account of their greater drought resistance. They are, however, somewhat too late in maturity for dry land conditions of cultivation, but show promise of being suitable for cultivation under irrigated conditions, particularly on eelworm infested soil. With a view to developing earlier maturing forms crosses have been effected among several varieties and strains.

Phaseolus

Breeding beans for the Transvaal highveld is in progress. The Large White Kidney variety *P. multiflorus*, grown extensively on the eastern highveld, has two particularly advantageous characters. Firstly its germination is hypogeal and the seedlings are thus less liable to break in pushing through crusty soils, and secondly, it has long flowering racemes with an extended flowering period so that it is able to set seed in spite of occasional droughty periods at the time of flowering. Attempts are being made to introduce these characters into *P. vulgaris*. Hybrids have been obtained by hand pollination from this highly sterile interspecific cross, but advanced generations have failed to yield a segregate combining the required characters; some segregates showing one or more of the desired characters were however obtained, and are to be used in further breeding investigations. Breeding for resistance to mosaic, rust, bacterial wilt and other diseases is also being carried out.

Cowpea

Breeding is in progress.

Attempts at crossing the cultivated cowpea with wild species of *Vigna* made with the hope of breeding eelworm resistant varieties have so far been unsuccessful; the hybrid embryos collapse after a certain stage of development.

A tetraploid type with a more upright growth habit than the diploid parental form has been produced by colchicine treatment; its value for hay purposes has not yet been determined.

Soya bean

Breeding for the non-shattering habit, early maturity, and increased height above the ground of the lowest pod with a view to facilitating mechanical harvesting, is reported.

Sweet corn

The first South African variety has been developed. It is a white-grained type, and shows a greater degree of drought resistance in comparison with imported varieties. Work is being carried out to breed a yellow-grained sweet corn.

29. 575:633(72.9)

Annual Report of the Department of Science and Agriculture Barbados for the year 1945-46 : Pp. 19.

Maize

In a field trial including Selected Barbados, Hawaiian Field Corn and Jamaica Selected Yellow varieties, the ears of the Jamaican and Hawaiian varieties were severely stripped by birds during the ripening stage, and in yield of grain per acre the Barbados corn was far superior. These results agree with previous ones.

Forage crops

Observations of lucerne indicate that it may prove a promising fodder crop where irrigation is available. Three mung bean varieties and the Jerusalem pea have been selected for further testing as short term forage crops. Experiments on 20 kudzu (*Pueraria Thunbergiana*) plants indicate that this is susceptible to lime induced chlorosis which would limit its use to the soils of the Scotland Series. Lists of grasses and legumes introduced for trial from the Imperial College of Tropical Agriculture, Trinidad, are given.

Cotton

Work was continued with selfed seed obtained from 13 plants selected from the progeny plots during 1944-45 and the standard variety B.1. Nine of these have been selected on yield of seed cotton per acre and ginning out-turn for further trial. A second variety trial included selections of the B.40′, B.41′, B.42′ and B.43′ Series with B.1. as standard. Nine strains were retained, the best of which will be included in a further trial with selections from the B.44′ Series and the standard B.1.

Sugar
The policy of increasing the viability of sugar cane seedlings by interspecific crosses within the genus *Saccharum* and intergeneric crosses with closely allied plants has been continued with very encouraging results. 90 seedlings were obtained from 114 crosses made in 1945. About 54,000 of the seedlings germinated and 25,413 of these were potted.
The 1946 Select Seedling Trials indicated that while none of the B.43′ series are likely to become commercial canes under Barbados conditions, B.41211 and B.41227 are promising, especially for early reaping and mid-early reaping respectively. B.41227 produced very few arrows in the experiments reaped, and B.4098, which has now been recommended for commercial plantings, maintained its high yield and good juice quality particularly in the high and intermediate rainfall areas.
Selections of the B.43′ series were tested for their reaction to the mosaic disease of the strain carried by B.2935, but the plants were rather old when inoculated and only one showed the symptoms. The experiment will be repeated.

Fruit trees
The propagation and distribution of fruit trees was continued.

Cowpeas
Eight Jamaican varieties have been finally selected and sufficient seed obtained from them for a definite trial.

30. 575:633(73)
Report of the Administrator of agricultural research 1946.
U.S. Dep. Agric. 1946 : Pp. 306.
Progress for the fiscal year ended June 30, 1946 is reported for the different Agricultural Bureaux of the United States. Work of interest to plant breeders reported in the various sections has been largely dealt with in the summaries of the annual reports of the agricultural experiment stations, the station bulletins and other sources of information.

31. 575:633(75.8)
Fifty-eighth Annual Report of the Georgia Experiment Station of the University system of Georgia.
July 1, 1945 to June 30, 1946 : Pp. 131.

Wheat
Sanford wheat has proved to be the best adapted variety in Georgia.

Oats
The new Lega variety, developed from the cross Lee x Victoria, has been distributed (cf. *Plant Breeding Abstracts*, Vol. XV, 620). It is rust resistant and suitable for grazing.

Maize
Hybrid production is reported.

Leguminous forage crops
Selections of annual lespedeza were compared for several characters. Superior selections of the Kobe and Korean types were obtained, and are to be further tested.
Sericea lespedeza (*Lespedeza cuneata*) is being selected. Different lots of *L. cuneata* and *L. stipulacea* showed different degrees of susceptibility to powdery mildew; but no marked specific difference in susceptibility was observed.
Crotalaria species are under observation as green manure and cover crops. *C. spectabilis* and *C. intermedia* show several advantages over other species, such as less seed-shattering, greater suitability for harvesting, higher seed yield and ability to volunteer.
Medicago lupulina, M. orbicularis, Trifolium lappaceum and *T. arvense* are under observation.
Hybrid pea selections have been obtained which are superior to the Austrian winter pea in several characters.
Vetch species were grown for observation on winter hardiness and disease reaction. *Vicia pannonica* and *V. grandiflora* were the only species showing a high degree of resistance to anthracnose (*Colletotrichum villosum*); the latter species, however, is susceptible to *Botrytis*

leaf spot. Most strains of vetch have proved fairly resistant to anthracnose. *V. villosa*, *V. atropurpurea*, *V. dasycarpa*, *V. tetrasperma* and *V. lathyroides* are highly susceptible.
Blue lupin is being selected for winter hardiness. The yellow lupin has shown much less winter hardiness than the blue, but unlike the latter, it has not become infected with *Botrytis cinerea.*

Cotton
Wilt resistant strains of Empire are being multiplied.
Wilt resistant selections of the hybrid CSS 3720, derived from the back-cross of Clevewilt x Stoneville 2B to Stoneville 2B, have compared favourably with commercial cottons. A number of Sea Island x Upland hybrids are being further selected to develop improved fibre quality and greater wilt resistance.

Capsicum annuum
Breeding for disease resistance is in progress. The Santanka and Hontanka varieties, of Japanese origin, show immunity to bacterial leaf spot. Selected plants of Santanka have been reciprocally crossed with selections of the Truhart Perfection pimiento. Resistance to bacterial leaf spot has been found to be a recessive character. None of the peppers so far tested have shown sufficient resistance to mosaic for breeding purposes. But a large number of additional introductions, mostly South American, are under test; it is hoped virus resistance will be found in this material.

Peanut
Breeding was continued.

Grapes
Breeding work is being carried out on the muscadine grape (*Vitis rotundifolia*) to develop self-fertile varieties, which compare favourably with pistillate varieties such as Hunt and Scuppernong.

Cucurbits
Georgia No. 2, a very sweet wilt resistant water-melon which cracks badly in wet seasons, was crossed with a small striped melon having a tough rind, in the hope of securing a small melon with the quality of Georgia No. 2 and a tough, non-cracking rind. Georgia No. 2 has also been crossed with Hawksbury.
The S2–1S, S20 and S46–3S cantaloupe strains obtained in earlier breeding work are resistant to both downy and powdery mildew. They were crossed with the aphid resistant variety Smith Perfect. In the year under review, strains derived from the crosses S2–1S x Smith Perfect and S20 x Smith Perfect were selected for aphid and mildew resistance. The cross S46–3S x Smith Perfect is to be discarded, as it shows fruit cracking.
Squash breeding investigations aim at developing a yellow summer squash resistant to borer and pickleworm. No viable seed was obtained by crossing the African Squash with Early Prolific Straightneck. The fertile F_3 hybrid of Zucchini x African Squash has been crossed with the African Squash; it is hoped that this complex hybrid will cross more readily with Early Prolific Straightneck.

Soya bean
The new Gatan variety developed from a natural cross of Otootan, has given satisfactory yields of hay and seed (cf. *Plant Breeding Abstracts*, Vol. XVI, 1136).
Possible varietal resistance to *Sclerotium Rolfsii* is under investigation.

32. 575:633(75.9)

Annual Report of the Florida Agricultural Experiment Station for the fiscal year ending June 30, 1946 : Pp. 206.

Oats
Breeding for resistance to *Helminthosporium Avenae* and other diseases is reported from the North Florida Station.

Maize
Hybrid production is in progress.
The theoretical regression equation $F_1 = b_1 (P_1 + P_2) /_2 + b_2 P_1 P_2$ has been used to analyse extensive data on yields in maize, in relation to the role of hybridity in vigour and high yielding capacity.

Forage legumes
A non-alkaloid yellow lupin variety, Florida Speckled, has been developed. It gives a good growth of early forage and is suitable for grazing and green manure. In yield it equals or exceeds other strains, and it volunteers satisfactorily. It is hoped that volunteering strains of sweet blue lupin will soon be developed.
Lotus uliginosus Schkuhr. is showing promise as a pasture legume for low damp areas.
Velvet bean breeding is being carried out to develop varieties better adapted to northwest Florida.

Sugar cane
Information is given on the performance of selections from the F36 to F45 series of crosses made at the Everglades Station.

Tobacco
The variety Copaneco from Honduras, obtained from the Division of Tobacco Investigations under the designation T.I. 706, appears to be more promising as a source of resistance to root knot nematode than *Nicotiana repanda* Willd. Numerous crosses between T.I. 706 and commercial varieties and breeding lines of flue-cured tobacco have been studied. The F_1 hybrids have shown less nematode infestation than the commercial flue-cured varieties. The F_2 generations are to be selected for a combination of root-knot resistance and satisfactory flue-cured leaf type.
Breeding for combined resistance to blackshank, downy mildew and root knot nematode in cigar wrapper types is in progress at the North Florida Station.

Aleurites
The fruits of *A. Fordii, A. montana, A. moluccana* and *A. trisperma* have been analysed for their oil content and quality.
A. montana x *A. Fordii* hybrids planted in 1942 flowered in the spring of 1946 but none set fruit; two trees from a back-cross to *A. Fordii* flowered but also set no fruit. Crosses between *A. trisperma* and *A. Fordii* failed to produce viable seed.

Fruits
Citrus breeding work is in progress at the Citrus Station.
Ruby x Supreme guava hybrids are under selection at the Subtropical Station.

Peanut
Dixie Runner [Dixie Giant x Small White Spanish (Fla. 231–51)], Ga. 207–3, Fla. 230–118 and Fla. 249–40–B–4 are being used in the breeding programme. Strain Fla. 230–118, an earlier maturing line than Dixie Runner, has outyielded the latter by 23% in yield trials. Further testing for yield and selection for plant and pod uniformity appear to be necessary, however, before strain 230–118 is released. Several new hybrid selections are under test.

Celery
Promising F_3 selections resistant to early blight have been obtained at the Everglades Station from Turkish celeriac x Cornell 19 crosses; the selections have been returned to Cornell University for seed production.

Water-melon
Breeding for *Fusarium* wilt resistance is receiving attention.
Crosses between Blacklee and anthracnose (*Colletotrichum lagenarium*) resistant material are being selected to develop an anthracnose resistant water-melon possessing high quality.

Tomato
Hybrids are being selected for early maturity and *Fusarium* wilt resistance.
Several lines with good commercial fruit size and combined resistance to *Fusarium* wilt and collar rot (*Alternaria Solani*) are being developed.
The production of lines possessing combined resistance to mosaic, grey spot and root knot is in progress.
F_1 hybrids of Grothen's Globe, Rutgers, Valiant and Stokesdale with the lines W43–1–1–1 and W41–2–3–1 showed marked hybrid vigour in yield. One F_2 line maintained a considerable degree of hybrid vigour.
Tomato breeding for disease resistance is also in progress at the Central Florida Station.

Egg plant
Breeding for resistance to *Phomopsis* blight is being carried out.

Pisum
The Creole garden pea continues to show nematode resistance.

Cowpea
The nematode resistant strains of the Conch cowpea, 18 and 19, are to be further tested for resistance.

33. 575:633(76.2)
Highlights of the work of the Mississippi Experiment Station.
58 Rep. Dir. Miss. Agric. Exp. Sta. 1945 : Pp. 47.

Oats
Promising strains have been developed. Mid-season and late maturing oats are being given particular attention. It should be possible to graze these later than earlier maturing varieties, and the straw they produce after grazing should be shorter than would be the case without grazing, thus facilitating combine harvesting.

Maize
Hybrid production is reported.

Forage crops
F_1 selections of a Johnson grass x Honey sorghum hybrid possess fairly large juicy stalks and short winter-hardy rhizomes. The selections are less prone to lodging than sorghum. Selections of a Johnson grass x Hodo sorghum hybrid combining large juicy stalks and short winter-hardy rhizomes, are now in the F_5 generation. Hybrid selections from both crosses show a high degree of fertility.
Breeding sweet sorghum for silage is also in progress.
Selection of interspecific *Paspalum* hybrids is mentioned.

Sweet potato
Varietal tests are reported. Seedling L–5, named Pelican Processor by the Louisiana Experiment Station and now rapidly replacing Triumph as a starch variety, gave a high starch yield.

Cotton
The results of varietal trials conducted by the Delta Branch Station in 1944 are summarized. Work is being carried out to improve the yielding capacity, drought resistance and several other characters of Delfos and Express. Promising new Delfos strains have been selected. An attempt is also being made to improve the yield of Missdel, Delta type Webber and other cottons.

Fruits
Pome and stone fruit breeding is in progress.

Cucumber
Breeding of pickling cucumbers is reported.

Tomato
Resistance to southern stem blight is being sought. *Lycopersicon pimpinellifolium* has so far shown the highest degree of tolerance to the disease.
Breeding for resistance to several diseases is being carried out at the Truck Crops Branch Experiment Station.

Beans
Breeding and selection of pole and snap beans are being carried out.

Soya bean
Progenies of crosses between northern and southern varieties are under selection at the Delta Branch Station to develop higher yielding, non-shattering strains ranging in maturity from late August to early November.
Vegetable soya bean varieties are being studied.

34. 575:633(76.9)

Fifty-ninth Annual Report of the Director of the Kentucky Agricultural Experiment Station for the year 1946 : Pp. 68.

Wheat

Tests of winter varieties are reported. Thorne, Vigo, Nured, Ky N S6 (Posey's Bluestem), Clarkam, Wabash, Purkof and another new Indiana strain were high yielding, and Clarkam and Fulcaster proved least susceptible to Hessian fly. New strains are being tested for disease resistance. Yield data for 11 white and 10 yellow maize hybrids are presented.

Oats

Of 30 varieties tested for winter survival, only Wintock, Fulwin and Hairy Culberson survived more than 50%. In a rod-row yield test of 34 varieties, Fulwin, Lemont, Traveler 1 and two selections of Lee-Victoria x Fulwin yielded more than 60 bushels and survived the winter comparatively well. In another test, Fulgrain and Lee-Victoria x Fulwin were outstanding because of their strong straw, and both yielded over 73 bushels per acre. Lee-Victoria x Fulwin was the only strain free of crown rust.

Spring varieties gave low yields owing to infection by *Helminthosporium Victoriae.* With the exception of a Victoria-Richland x Morota-Bond selection, all varieties and strains with the Victoria gene for crown rust resistance were heavily damaged by this disease. Columbia Fulton, Clinton and Benton were only lightly infected, and new strains with the Bond type of crown rust resistance showed promise of being resistant.

Maize

Yield data and the effects of drought on various maize hybrids are reported. The reactions are compared of five commercial hybrids to different degrees of soil fertility. Hybridization experiments are in progress with inbred lines at Lexington. The results of an investigation of "scattergrain" hybrids are described.

Barley

In plot tests of winter varieties, Kentucky 1, Purdue 21, Purdue 28154 and Purdue 28156 gave significantly higher yields than Reno. Wong, Jackson 1, Ohio 1, Admire, Tennessee Winter and W. Va. 1–34–127 equalled Ky 1 in yield in rod-row tests. On the basis of all tests in the past three years, Ky 1 is stated to be the best winter barley available for Kentucky.

Resistance tests are being carried out on new varieties from a composite cross.

Forage crops

Yield data are given for Ky 31 fescue. Tall fescue varieties showed no significant difference in yield in 1946, but in 1944 Ky 42 significantly outyielded Alta. The ten best strains of Kentucky bluegrass developed by the Kentucky station were superior to other varieties and strains in herbage production. Southern bromegrass proved superior in yield to northern bromegrass. It is concluded that the yield of legume and grass forage crops depends largely on choice of strain and variety. Kenland, a new variety of red clover, is compared with Kentucky 215 as regards yield, vigour and longevity. Yield data are given for varieties of red clover, lucerne and lespedeza. Of 6 strains of red clover tested at the substation, Ky 215 gave the highest yield in both first and second cuttings. Tests of different strains of Kentucky bluegrass proved the superiority of some selected strains, some of which are being submitted to further testing.

Sweet sorghum

Cedar Ribbou, Black Top and Williams yielded 113·3, 110·2 and 174·7 ten lb. pails of 80% syrup per acre respectively. That produced by Black Top was poor in colour; that produced by Cedar Ribbou was good but inferior to that of Williams.

Tobacco

By crossing tobacco with *Nicotiana glutinosa,* varieties of burley and dark tobacco have been produced which remain completely free from mosaic. Further interspecific crosses have been made in an attempt to develop resistance to other diseases, and one of the hybrids shows high resistance to wildfire. The reaction of 35 *Nicotiana* species to streak virus was tested. *N. glauca* and *N. Gosseii* seemed sufficiently resistant to be useful as breeding material. The results of black root rot resistance trials are described, and Ky 56 is recommended

for extensive trial. The mosaic free variety Ky 160 was grown successfully in Simpson and neighbouring counties. Certified seed will be available for the 1947 crop. Ky 151, also mosaic free, gave a satisfactory yield and quality in Todd county. Average yields, for several years, of dark tobacco varieties are reported. Seven mosaic resistant strains grown at the substation are of medium to good dark type and produce leaves of good quality.

Apples
The varieties Herralson, Anoka, Close, Red Bird, Lodi, Red Gravenstein, Orleans, Macoun and Kendall have shown exceptional merit in trials. Their characteristics are described. Of several varieties tested at the substation, Stayman was by far the highest yielding of the cover crop varieties, and Lodi gave the best yield among the early varieties.

Plums
The Stanley plum of the prune type proved superior to the other varieties tested at the Kentucky Station. The performance of varieties at the Western Kentucky Substation is described.

Raspberries
Plantings of Morrison black raspberries and Quillen, in their second year, produced 254 and 234 crates per acre respectively.

Peaches
Varieties which produced the heaviest crops were Cumberland, Erly Red Fre, Early Rose Raritan Rose, Triogem, Halehaven, Viceroy, Hiley, Veteran, Ideal, Summercrest, K 43, Golden Gem, Afterglow and Barbara. Several new varieties showed promise as sorts for transport and others gave promise of general usefulness.

Strawberries
Tennessee Beauty was superior to all other varieties tested and is recommended for trial in all commercial strawberry areas. Blakemore, Premier, Catskill, Fairfax, Tennessee Skipper, Tennessee Beauty, Tennessee Supreme and Gandy were about equally susceptible to red core disease. Yield data for different varieties are reported from the Western Kentucky Substation Tennessee. Supreme ranked first with 201 crates per acre.
So far no plants affected by yellows have appeared in a Blakemore strain received from the U.S. Department of Agriculture in 1939. Occasional plants affected by yellows continue to appear in the McUmber's Yellows Resistant Blakemore variety.

Blackberries
Ozark Beauty, Eldorado, Early Harvest and Alfred set heavy crops, but Alfred has now been virtually eliminated by orange rust. The other varieties mentioned were slightly affected.

Grapes
Portland has shown much promise as one of the best early white varieties. The yield and quality of the recently introduced Concord Seedless grape have been disappointing.

Tomatoes
Of 31 varieties tested, U.S. 18, Master Marglobe, Campbell 409, Pritchard, Grothen's Globe, Garden State, Campbell 164, Rutgers and Stokesdale ranked best for size and yield.

Lima beans
The yields per acre of unshelled beans and descriptions of beans of different varieties are given. Fordhook 242 produced the highest yield, and Burpee's Improved Bush produced the largest beans.

Sweet corn
Three varieties which had shown merit in previous years are Tristate, Golden Grain and Aristogold Batam Evergreen, arranged in descending order of yield, and Golden Grain, Tristate and Aristogold Batam Evergreen, arranged in decreasing size of ear. All have a light yellow kernel and are of excellent quality.

Popcorn
Nine Purdue hybrids used commercially in Indiana were tested in comparison with South American and Supergold open-pollinated varieties. Yields were low owing to climatic

conditions. Purdue 34 gave the highest yield, Purdue 38 ranked second and Purdue 32 had the best popping qualities.

35. 575:633(77.7)

Report on agricultural research for the year ending June 30, 1946.
Rep. Ia Agric. Exp. Sta. 1946 : Pt. I : Pp. 336.

Statistics
Principal attention has been devoted to the following problems: the bias involved in different sampling procedures; the analysis of data from lattice designs, using in some cases punched cards; the evaluation of combining ability using single testers; the comparative efficiency of systematic and random sampling; the estimation of variance components, especially when the number of observations in the subclasses are unequal; and the general theory of χ^2 testing.

Bacteria
Experiments have shown that virulence in bacteria may be generated or lost by mutation, at a rate comparable to the rate of mutation for other characters occurring in *Drosophila*. Two types of bacterial mutation have been noted, a stable type and an unstable type. The former type mutates at a low rate, while the latter mutates at a rate 10 to 50 times that of the stable type. Further investigations are being carried out on the nature of these different rates of mutation.

Drosophila
Genetical investigations on hybrid vigour as shown by egg production are reported.
It has been demonstrated that hybrid vigour is the result of genic action and not cytoplasmic dissimilarity.
Genes possessing general combining ability and genes having specific combining ability both play an important part in causing hybrid vigour.
Experiments have also shown that hybrid vigour and chromosomal heterozygosis are linearly related. No interactions or combination effects between the three chromosomes investigated could be detected. Significant increases in heterosis were found for each chromosome made heterozygous. Hybrid vigour due to individual chromosomes was closely proportional to their active length. Both plus and minus genes were found to be located on all the chromosomes. The minimum number of gene pairs necessary to account for the results was eight or nine.
Preliminary experiments on the nature of the gene action determining hybrid vigour suggest that complete dominance accounts for hybrid vigour more satisfactorily than partial dominance or complementary gene action.
Six mutations were observed in genes located in chromosome III which modified sex inheritance. This result shows that strongly localized sex inheritance may occur in chromosomes other than the so-called sex chromosome.

Wheat
New hybrid material was selected for disease resistance.
The following varieties and strains were sown for field trials in the 1945–46 crop: Pawnee, Kawvale, Iobred x Minhardi (45–716), Iobred x Minhardi (45-714), Iobred x Minhardi (45–713), Marmin, Ioturk, H44 x Minturki (Minn. II–35–49), (Hope x Minturki) Mint. (Minn. II–31–82), (Hope x Minturki) Mint. (Minn. II–31–78), Blackhawk and Iowin. Those varieties and strains which warrant trial outside of Iowa will be included in the Hard Red Wheat Uniform Yield Test sponsored by the United States Department of Agriculture.

Oats
The value of the new disease-resistant hybrid selections involving Bond was demonstrated, particularly in the case of Benton and Clinton (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 100). These two varieties, which were distributed to farmers in 1946, have the advantages of higher yielding ability and test weight over the recently distributed Boone, Tama, Marion and Control varieties; they also possess stiffer straw than the older varieties. Another new variety known as Eaton is being increased for distribution in Michigan; it is a selection developed at Iowa from the cross Bond x Iogold.

Susceptibility to a new species of *Helminthosporium* (*H. Victoriae*) appears to be closely linked with a gene for the Victoria type of resistance to crown rust. Varieties not possessing this type of crown rust reaction, including Clinton, Benton and other Bond hybrid selections were, however, uniformly resistant to *H. Victoriae.*
In a test of resistance to halo blight (*Pseudomonas coronafaciens*), Clinton was among the most resistant varieties and selections.

Barley
Selections of Lion x Manchuria x Chevron, Peatland x Vaughn and Peatland x Dryland were given a preliminary test.
Wisconsin 38, Glabron, Velvon 8, Tregal and Manchuria C.I. 4924 were among the varieties most susceptible to *Pythium graminicola*, while Peatland, Pillsbury, Purdue 21 and selections of Fond-du-Lac were among the less susceptible. Manchuria barley shows moderate resistance to *Helminthosporium*; Chevron is moderately resistant to *Gibberella.*

Forage grasses
Interspecific crosses were obtained from a number of crosses made among members of the *Bromopsis* section of *Bromus.* Inbreeding was associated with a reduction in self-fertility; a few plants have, however, proved to be highly self-fertile even in the S_3 and S_4 generations. The value of the polycross method for the prediction of combining ability is under investigation; among tall erect plants there appears to be a marked correlation between the yields of mother clones and the yields of their polycross progenies. Selfed selections of the southern varieties, Lincoln, Achenbach and Fischer, have been obtained. These are to be tested in three ways, using open-pollinated seed, selfed seed and vegetatively propagated clones. Yield trials to compare southern varieties with the Canadian type, both when grown alone and with lucerne, are in progress.
A new synthetic variety of reed canarygrass (*Phalaris arundinacea*) produced by the recombination of 10 strains has been named Ioreed. A polycross test, including the ten strains forming the Ioreed synthetic, is under investigation. Improvement of Kentucky bluegrass (*Poa pratensis*) is being carried out.

Leguminous forage plants
Breeding for low coumarin content in *Melilotus* continues. Hybridization involving thirteen different species of *Melilotus* was attempted. Interspecific cross fertility was in general very low, but it was possible to cross several species with *M. alba* and *M. officinalis*; F_1 plants are to be studied in detail in 1947. The production of synthetic varieties from autotetraploid strains of sweet clover is receiving attention. White clover breeding is reported.
A polycross trial including 25 lines selected from the Emerson red clover is in progress. Studies of the length of the corolla tube in relation to seed setting were renewed. The material investigated consisted of the Emerson and Zofka red clovers; the latter is a European strain with fairly short corolla tubes. Corolla tube length varied from 8·70 mm. to 11·35 mm. in Emerson, and from 7·80 mm. to 10·85 mm. in Zofka. F_1 hybrids involving the corolla combinations of short x short, long x short and long x long have been obtained. Back-crossing is to be effected, in an attempt to combine short corolla tube with desirable characters such as hairy stems, vigorous growth and good seed production.
Lucerne clones are to be further evaluated by testing their selfed and polycrossed progenies; the clones show marked differences in plant type, insect resistance, winter survival and forage yield. The effect of self-fertility upon combining ability is being studied in lucerne. The production of a synthetic variety of the low crown type is in progress.
S_1 plants of *Lotus tenuis* were crossed to determine the type of sterility. It was found that the oppositional factor hypothesis does not provide an adequate explanation of the results obtained, since the presence of additional factor pairs conditioning sterility is evident.
The L48 strain of lespedeza is to be increased in the spring of 1946. It is comparatively high-yielding, though a little later maturing than the L6 and L39 strains released for increase in 1945 (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 100). It is considered that L48 will be well adapted for southern Iowa.

Potato
Hybrid seedlings were selected for scab resistance. The introduction of seedling No. 116—Iowa 13 is recommended by growers under the name of Lake. It originated from the cross Richters Jubel 528–229 x 528–170.

Sweet potato
A Yellow Jersey sport is to be distributed under the name Muscatine Jersey; it has orange flesh and a darker skin than Yellow Jersey.

Lophanthus
The possibilities of cultivating anise hyssop (*L. anisatus*) in Iowa as bee pasture and a source of volatile oil are under investigation; Pellett's selection and Martin's All-season selection are being tested.

Apple
Vitamin C analysis of 29 varieties has indicated that except in the case of Willow Twig and its sport Red Willow the ascorbic acid content in the varieties studied is fairly low, averaging about 6 mg. per 100 grm. The Willow Twig variety, analysed for a three-year period, possessed an ascorbic acid content of 19 to 23 mg. per 100 grm. Willow Twig also showed a significant synthesis of ascorbic acid content during a seven-month's period of storage, whereas in the other varieties studied the vitamin C content decreased rapidly during the first weeks of storage. The inherently high concentration of ascorbic acid in Willow Twig indicated the possibility of breeding apples with as high a vitamin C content as in the tomato. Approximately 50 hybrid seedlings selected for further testing are listed. In general, parental hardiness has been transmitted to the progeny. The Russian Antonovka apple has produced particularly hardy seedlings with satisfactory growth, whatever the degree of hardiness of the other parent.

Plum
Seedlings of interspecific hybrids are under observation.

Peach
Hybrids of *Prunus Davidiana* x peach continue to show superior hardiness.

Rubus
Black and red raspberry breeding continues.

Onion
F_2 crosses of Yellow Globe possessing the factor for pollen sterility were back-crossed in the greenhouse to inbred lines of Brigham Globe, in order to improve the bulb type of the former variety.
A synthetic hybrid produced by the massing of 19 inbred lines of Brigham Globe was more uniform in bulb size and colour than two commercial strains of Yellow Globe.
F_2 hybrids between White Persian and Scott County Globe have been selfed and back-crossed to Scott County Globe. The thrips resistant nature of the foliage of White Persian has been transferred to Scott County Globe, but back-crossing for one or two generations will be required to secure satisfactory bulb characters.
The Yellow Sweet Spanish onion is being selfed to eliminate the character of non-seeding.

Cucurbita moschata
Inbred lines of the Kentucky Field pumpkin have been isolated, exhibiting considerable uniformity of fruit size, shape, colour of skin and flesh; the lines are also earlier maturing than the original variety.

Tomato
Haploid, diploid and autotetraploid forms were found to possess the same relative growth rates. Continued selection for increased fertility in the autotetraploid form derived from a diploid, which was obtained from the sterile haploid form, was ineffective.
Hybrids between *Lycopersicon esculentum* and wild *Lycopersicon* species are under investigation. Undesirable fruit characters inherited from the wild parents include a green seed sac, thin outer and inner walls, tough skin, a white wall round the stem end of the fruit, pubescent skin, and small size. The following strains are, however, segregating for large fruit, although the fruit is not yet of commercial size: (Rutgers x *L. hirsutum*) x Rutgers;

Rutgers x *L. pimpinellifolium*; (Rutgers x *L. pimpinellifolium*) x Rutgers, [Indiana Baltimore x *L. pimpinellifolium* (Acc. 160)] x Indiana Baltimore; and (Indiana Baltimore x *L. peruvianum*) x Indiana Baltimore.

Soya bean

The use of Oriental introductions in hybridization has resulted in promising material.

One of the chief aims of breeding work is to develop new early maturing varieties for northern Iowa. Nineteen hybrid strains have outyielded Habaro, the highest yielding control variety; some of these strains also exhibited superiority in resistance to lodging and in chemical composition. Selfed strains from the back-cross (Lincoln x Richland) x Richland showed promise of combining the lodging resistance of Richland with the yield, plant height and high oil content of Lincoln. A number of these strains not only outyielded Habaro, but were earlier and taller than this variety, and more resistant to lodging. Pedigree selection tests are also reported; 17 of the 21 F_7 strains tested outyielded Earlyana. Study of the bulk yield method of testing continues, with a view to its possible value for the elimination of whole crosses early in the segregating generations.

Data were obtained suggesting that single plant selection in the F_2 generation for maturity and plant height forms a reliable method of selection.

36. 575:633(78.7)

Fifty-sixth Annual Report of the Wyoming Agricultural Experiment Station 1945-46 : Pp. 61.

Wheat

Breeding is in progress.

Oats

The new variety Overland (C.I. 4181) has given a promising performance as a nurse crop under irrigation on heavy soils (cf. *Plant Breeding Abstracts*, Vol. XVII, 1511). It was developed from the cross (Victoria x Richland) x Bannock; it is not yet available for distribution. The variety has white grain with good quality, and short strong straw.

Barley

The new variety W–47 may be released in 1947.

The Ezond Sel. W–3 and Compana varieties have shown a high degree of resistance to loose smut.

Potato

Resistance to ring rot is receiving attention. Evidence has been obtained that infected potato strains tend to rid themselves of ring rot infection. In 1944, three resistant strains showed an average of 57·3% infection following inoculation; in the following season only 17·7% of the tubers were infected. The work is being continued to determine whether a potato strain will completely eliminate the infection within a few years.

37. 575:633(78.8)

59th Annual Report of the Colorado Agricultural Experiment Station 1945 : (1946) : Pp. 21.

Wheat

Hybrid selections showing resistance to bunt and rust have been developed.

Oats

Breeding work has resulted in the production of loose smut resistant selections.

Maize

Hybrid production is reported.

Barley

New hybrid selections resistant to stripe and smut are under test.

Lucerne

The Meeker Baltic variety, developed by the Colorado Agricultural Experiment Station, has been registered.

38. 575:633(79.7)

Year book of the Carnegie Institution of Washington 1944-1945: (1945) : No. 44 : Pp. 196.

Demerec, M. Department of Genetics. (*pp. 103–08*).

A review is given of work carried out by the Department of Genetics during 1944–5.

McClintock, B. Cytogenetic studies of maize and Neurospora. (*pp. 108–12*).

Methods of inducing specific mutants in the form of internal deficiencies in the short arm of chromosome 9 in maize, arising as the result of the so-called chromosome and chromatid types of "breakage-fusion bridge" cycle, are theoretically discussed. During the year under review, non-selective methods have been used to determine whether the new mutants expected on theoretical grounds actually are being produced. To isolate new mutants produced by the chromatid breakage-fusion-bridge cycle, the F_2 progeny derived from F_1 plants that had received a recently broken chromosome 9 from one parent were examined; to isolate new mutants produced by the chromosome breakage-fusion-bridge cycle, the selfed progeny of individuals that had received a newly broken chromosome 9 from each parent were investigated. The search for new mutants was confined mainly to the characters of the kernels and seedlings. Although 69 mutants arising from breakages in chromosome 9 have been obtained, only seven distinct phenotypes are represented because the same mutations occur repeatedly. It is reported that a small kernel mutant, *smk*, and a spotted leaf mutant, *spl*, are located in the distal third of the short arm, and that a pale green mutant, *pg*, is located between the *sh* and *wx* loci. Many pale yellow seedling mutants (*pyd*) and white seedling mutants (*wd*) also occurred (cf. *Plant Breeding Abstracts*, Vol. XVI, 1590–2). A few yellow green seedling and plant mutants (*zd*) were observed.

In three of the broken chromosome cultures investigated, one of the broken chromosomes 9 is continually being lost from cells during development. This loss is not due to bridge or ring formation, but appears to be caused by the inability of the two halves of this chromosome to pass to opposite poles in some of the somatic anaphases. The rate of loss varies widely from plant to plant. Within a single plant, changes in the rate of loss also occur, as shown by the presence of distinct sectors each with its own rate of loss. Several of the mutants appearing in these cultures show variegation characterized by a change from mutant tissues to tissues normal in appearance.

Studies were made on the chromosomal and nuclear behaviour of *Neurospora crassa* during a visit to the Biological Laboratory, Stanford University. Observations are reported on chromosome number, the absolute and relative sizes of the chromosomes, centromere positions, chromosome structure, zygote formation, the behaviour of the chromosomes in the two meiotic mitoses following nuclear fusion and in the subsequent equational mitosis, and translocations induced by radiation.

Warmke, H. E.
Davidson, H. and
LeClerc, G. *Polyploidy investigations.* (*pp. 113–15*).

A study has been made of a spontaneous breakage of the Y chromosome in *Melandrium* in which are located the main male-determining genes, and of the number, position and mode of action of the male genes in this breakage material. Meiotic bridges have been observed, involving the Y chromosome, in sufficient numbers to account for the observed incidence of breaks. These bridges are not, however, of the usual type, resulting from crossing over in heterozygous inversions. The bridges appear to be largely restricted to the second meiotic division, and are not accompanied by acentric fragments; the cause of bridge formation appears to be associated with asynapsis of the Y chromosome. By studying plants with various types of Y chromosome deficiency arising from the spontaneous breakage, the process of male development has been analysed into three stages: (1) the initiation of maleness, (2) the completion of maleness, and (3) the suppression of femaleness. The first of these processes is conditioned by a gene or genes near the centromere of the Y chromosome, the second by a gene or genes near the top part of the differential arm, and the third process by a gene or genes near the end of the homologous arm. The genes controlling these three stages appear to be qualitatively distinct.

Demerec, M. and Luria, S. E. *The gene.* (*pp. 115–21*).

A technique is described by means of which mutants of *Escherichia coli* resistant to bacteriophages can be detected; it involves the application of the phage to the culture by spraying it as an aerosol. The data obtained by this technique on the rates of mutation induced by ultraviolet radiation of 2537Å wave length show that the increased mutation rate due to ultra-violet light treatment persists over a considerable period of time, the mutation rate reaching its normal level after the bacteria have passed through ten to twelve divisions.
Work is being carried out on the resistance of *Staphylococcus* to penicillin, sulphonamides, inorganic salts, bacteriophages, and ultra-violet radiation.
Two types of mutant resistance to penicillin have been identified. In the first type the cells acquire tolerance to higher concentrations of the antibiotic, without other evident physiological changes. In the second type the *Staphylococcus* bacteria secrete an inactivator of penicillin, penicillinase. The genetic basis of the latter type of resistance remains obscure.
In the course of these investigations, a rapid quantitative test for penicillin resistance in staphylococci has been devised for use in medical laboratories.
Improved methods of studying mutant resistance to ultra-violet radiation have been developed (cf. *Plant Breeding Abstracts*, Vol. XVIII, Abst. 1584).
The problems of mutation to sulphonamide resistance are being extensively investigated (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1589).
Details are given of a standard procedure developed for the production of high yielding mutants of *Penicillium* by X-ray treatment. Using this method, a strain now known as X-1612, has been obtained, yielding about twice as much penicillin as the strain 1951.B25 from which it originated.
A method has been devised for treating adult *Drosophila* flies with aqueous solutions of various chemicals, by keeping the flies in an atmosphere containing an aerosol of the solution in question. Observations on flies treated with aerosols of various dyes indicated that the material was present in the crop and digestive organs, and in some instances, in the testis. The possible mutational effect of the chemicals is to be investigated.

Kaufmann, B. P. and Gay, H. *Cytogenetics of* Drosophila. (*pp. 121–27*).

Experiments were continued on the mechanism of chromosome breakage and recombination by treating spermatozoa of *Drosophila* with combinations of either of X-rays and ultraviolet light or of X-rays and near infra-red radiation (cf. *Plant Breeding Abstracts*, Vol. XVII, Absts 112 and 113).
The frequency of spontaneous lethal mutation in the X chromosome of *Drosophila* was determined.

Dobzhansky, Th. *Genetic structure of natural populations.* (*pp. 127–34*).

Investigations are reported on the changes in the frequencies of different inversions, known as the Standard, Chiricahua and Arrowhead types, occurring in chromosome 3 of *Drosophila pseudoobscura* in natural and artificial populations. In two of the three locations in California where the natural populations were studied, cyclic changes in frequencies associated with seasonal factors were observed, some variants being more favourable in the process of natural selection in spring and others in summer (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1390). In the artificial populations, changes analogous to those recorded in the natural populations were observed when the population cages were kept at 25° C., i.e. at summer room temperature; at lower temperatures the composition of the artificial populations remained constant. The genetic basis of the adaptive properties of the different chromosomal types is discussed.
Experiments on interspecific hybridization between *D. pseudoobscura* and *D. persimilis* are being carried out.
Field experiments on the dispersion rates of *D. pseudoobscura* are reported to be in progress (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1547).

39. 575:633(79.7)

Year book of the Carnegie Institution of Washington 1945-1946 : (1946) No. 45 : Pp. 235.

Demerec, M. *Department of Genetics.* (*pp. 139–42*).

Investigations carried out during 1945–6 are surveyed.

Demerec, M.,
Latarjet, R.,
Luria, S. E.,
Oakberg, E. F. and
Witkin, E. M. *The gene.* (*pp. 143–57*).

The relation between various dosages of ultra-violet radiation and X-rays and the frequency of induced mutations in *Escherichia coli* to bacteriophage resistance was investigated. The relation between the rate of zero-point mutations, i.e. mutations expressed before the bacteria pass through the first division, and dosage follows a straight line, which can be considered as the beginning of an exponential one-hit curve. This result suggests that mutation is induced by the direct action of the radiation on a limited locus in the cell, which is not larger in volume than a single cluster of ionizations. The most probable explanation of the mechanism of the observed behaviour is gene mutation.

Experiments were carried out on the exposure of cells of *E. coli* infected with phage to ultra-violet light to study the problem of bacteriophage multiplication within the host cell.

Spontaneous mutations of *E. coli* showing complex resistance to phage were studied. Two complex mutants separable by their reaction to phages T1–T7 and to several of their mutants, certain growth characteristics in complete media and specific growth requirements, were phenotypically the exact super-position of two common mutant phenotypes. Other complex mutants could not be interpreted as combinations of simple phenotypes. The results suggest that a genetic mechanism exists by which different mutations may be to some extent interdependent, since the frequency of mutation to resistance to T2, apparently negligible for the wild type B, is high in a special group of mutant strains; evidence was obtained indicating that the frequency of this mutation in the particular group was not due to a selective advantage. The possible genetic mechanisms of the dependence of this particular mutation upon previous mutation are discussed; it is suggested that mutation of a suppressor locus is involved. In addition, some evidence was obtained that genetically determined abilities to adsorb certain phages and liberate others are associated.

Investigations were carried out on phage-resistant mutants of *Shigella paradysenteriae*, to determine whether mutations giving rise to phage resistance might also produce dissociation of antigenic from toxic properties, which would be valuable in the production of non-toxic antigens for use as vaccines. Although some variation in toxicity was recorded, none of the mutants was appreciably less toxic than the parental strain. It was found, however, that a close but not absolute correlation exists between antigenic type and phage sensitivity; and also that cross-resistance groups of phages determined by tests with dysentery organisms are different from those determined for *E. coli*. The latter result confirms the conclusions that cross-resistance is not a criterion of phage relatedness. It also supports the hypothesis that cross-resistance depends on suppression by mutation of some reaction necessary for more than one chain of reactions in the bacterial cells.

Investigations on resistance in *E. coli* to ultra-violet light and X-rays are reported (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1584). The results of continued investigations on *Staphylococcus* mutation to sulphonamide resistance are also described (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1589).

Further study of spontaneous mutation in *Staphylococcus* to penicillin resistance has provided evidence that resistance and the capacity to produce the penicillin inactivator penicillinase are not correlated.

Heritable mutations of *S. aureus* and *E. coli* exhibiting resistance to streptomycin were obtained, whose occurrence was independent of the antibiotic. The resistance developed in

steps; the first step showed considerable variability, and in an appreciable proportion of cases exceeded the higher steps. This behaviour is in contrast to that of penicillin resistance, in which the first step is invariably small.
Giemsa and Feulgen techniques for making cytological studies of *E. coli* are described. The former technique proved to be the more satisfactory for obtaining clear, reproducible staining of the nuclear body. Cytological modifications occurring during intracellular phage growth were investigated.
Using the aerosol technique for the chemical induction of mutations in *Drosophila*, a considerable number of sex-linked lethals were produced by treatment with methyl-bis (betachloroethyl) amine or nitrogen mustard.

Kaufmann, B. P., McDonald, M. R. and Gay, H. — *Organization of the chromosome.* (*pp. 158–62*).

Study of the structure of the chromosome by means of the phase-contrast microscope is being undertaken.
By the determination of the distribution of X-ray induced breaks along *Drosophila* chromosomes, evidence has been obtained indicating that the intercalary subdivisions, which are characterized by a high frequency of breaks, contain heterochromatin; and that intercalary heterochromatin is distributed throughout the X chromosome and is not restricted to a few widely restricted loci.
Preliminary experiments on the effect of supplementary radiation on the frequency of lethal mutations due to chromosomal rearrangements in *Drosophila* have shown no significant differences between the percentage of the lethal mutations induced in flies receiving both near infra-red X-ray treatment and in those subjected only to X-rays.
Work is also being done on the chemical composition and organization of the chromosomes. Histochemical techniques and the use of crystalline enzymes are discussed. Modifications of the Bates method of testing for tryptophane are being developed. Crystalline trypsin, chymotrypsin, ribonuclease, pepsin and desoxyribonuclease have been prepared, and are being assayed for purity and specific activity.

Dobzhansky, Th. — *Genetic structure of natural populations.* (*pp. 162–71*).

Further experiments are reported on the frequencies of the three different types of chromosome inversion in chromosome three of *Drosophila pseudoobscura* occurring in artificial population cages. Data have been obtained showing that under the conditions in the cages structural heterozygotes survive better than structural homozygotes.
Field experiments on the dispersion rates of *D. pseudoobscura* as determined by means of the mutant character of bright-red eyes were continued (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1547).
Further progress in experiments on interspecific hybridization between *D. pseudoobscura* and *D. persimilis* is reported.

McClintock, B. — *Maize genetics.* (*pp. 176–86*).

The study of the induction of new mutants in the short arm of chromosome 9, arising as the result of chromatid and chromosome breakage fusion-bridge cycles, is now almost complete. At present nine new mutants have been isolated. The mutants pale yellow seedling (*pyd*), white seedling (*wd*) and yellow green seedling and plant (*yg*) have been repeatedly induced. Only one each of the following mutants has been secured: bronze aleurone, virescent seedling, pale green seedling, small kernel, narrow leaf and light green plant. Cytological investigations on the chromosome 9 carrying a new mutation have been carried out in the case of 13 *pyd* mutants, eleven *wd* mutants, eight *yg* mutants, and the small kernel, pale green and bronze aleurone mutants. In twelve of the *pyd* mutants, all of the *wd* mutants, the small kernel mutant and bronze aleurone mutant, a chromosomal deficiency or an obvious alteration were evident at the "locus" of the mutant. In the remaining cases the particular chromosomal event that gave rise to the mutant character could not be determined.

Four new mutants not located in chromosome 9 are also reported. One of these mutations, a simple recessive producing small kernels with defective embryos, showed a possible relation to the mutant *c* located in the short arm of chromosome 9. The recessive mutant gene *c*, when homozygous produces kernels that have no colour in their aleurone layer; the dominant allele *C* gives rise to coloured aleurone. Plants heterozygous for both mutants were self-pollinated. Coloured and genotypically colourless kernels, and normal and small kernels, segregated independently. The small kernels in the homozygous *cc* class were not however phenotypically colourless; instead they showed a blush of colour in the aleurone layer.

Further study of the recessive spotted leaf mutant, *spl*, has revealed that its inheritance is not typical of a simple recessive, and that its locus cannot be placed in the short arm of chromosome 9 in the usual manner as previously reported. The data indicate that the spotted leaf character appears wherever a plant is homozygous for any one of the deficiencies of chromosome 9 producing the *pyd* mutant, and also possesses one normal chromosome 8 and one chromosome 8 with a segment composed of six chromomeres translocated from the short arm of chromosome 9. This segment of chromosome 9 is not an unmodified segment since before its translocation to the short arm of chromosome 8, it has been subjected to breakage-fusion bridge cycles. Possibly the segment that has been translocated to chromosome 8 is itself incomplete and has a very minute deficiency for a segment of chromatin within the limits of the larger deficiency producing the *pyd* mutant; plants having two *pyd* chromosomes 9 and the duplication carried by chromosome 8 would then be homozygous deficients for a minute segment in the tip region of chromosome 9 even smaller than that producing the *pyd* character. If this is so, the spotted leaf character should behave as a simple recessive mutant, located close to the tip of the short arm of chromosome 9, and showing allelism with *pyd* and *wd*. Such behaviour has not been detected; it is pointed out, however, that this may be due to the fact that the spotted leaf mutant cannot be detected in the seedling stages, which have been used almost exclusively for the investigation of the new mutants.

Up to the present, 14 new mutants showing variegation or mosaicism have been isolated. In all the cases so far investigated a number of different rates of mutation have been observed among different individual plants and also within the sectors of a single individual plant. The data obtained suggest that, except in one case, the different rates of mutation are due to gene mutation probably occurring during a single mitosis. The exceptional variegated mutant is the result of a break at a particular locus in the chromosome, producing a deficient centric chromosome and an acentric fragment that is subsequently lost during mitosis. In this case a single break in a somatic nucleus corresponds to the single gene mutation in the other variegated mutants.

Stephens, S. G. and
Cassidy, B. J. *Cotton genetics.* (*pp. 186–90*).

The development of the seed of the hybrid *Gossypium arboreum* x *G. Davidsonii* was studied. The early death of the embryo, which has always been observed in this interspecific hybrid, was found to be due to the failure of the endosperm. Attempts to culture immature embryos have so far proved unsuccessful.

Partially fertile allotetraploids have been synthesized by colchicine treatment of hybrids between *G. arboreum* and *G. herbaceum* on the one hand and the two wild Old World species *G. anomalum* and *G. Stocksii* on the other. These allotetraploids are to be intercrossed with a view to comparing the genetics of the genomes of *G. anomalum* and *G. Stocksii*.

Chemical studies were made of the pseudo-allelic series conditioning anthocyanin pigmentation in the Asiatic cottons, in order to investigate the origin of two neighbouring loci. The results indicate that adjacent genes control closely similar chemical reactions but act on distinct though chemically similar substrates, supporting the view that the two loci originated by a process of duplication, which has been accompanied or succeeded by the development of specificity in substrate requirement.

The probable case of pseudo-allelism in the Crinkle (cr^D) and Contorta (cr^C) series, affecting plant growth in the New World amphidiploid cultivated cottons and apparently associated with the synthesis of indole, is also being investigated.

40. 575:633(96.9)

Biennial Report of the University of Hawaii Agricultural Experiment Station for the Biennium ending June 30, 1946 (1947) : Pp. 157.

Forage crops

The Leoti x New Guinea sorghum hybrid gives promise as a perennial forage grass. A number of crosses have been made to breed a perennial type of sorghum with sweet juicy stems.

A selfed line of cattail millet (*Pennisetum glaucum*, $2n = 14$) was crossed with pollen from an East African strain of Napier grass (*P. purpureum*, $2n = 21$). The 34 F_1 hybrids obtained included plants with $2n = 28, 21, 18, 16$ and 14. The reciprocal cross gave plants with $2n = 21$.

Capsicum annuum

Resistance to mosaic is receiving attention. The Waialua variety appears to be highly tolerant to the local pepper mosaic virus, but is susceptible to tobacco mosaic. Hybrids between Waialua and the tobacco mosaic resistant Princeton pepper are under test.

Cinchona

Seedlings of improved strains of *C. Ledgeriana* have been introduced with a view to investigating their adaptability to Hawaiian conditions, as a preliminary step in a programme of breeding and selection.

Tree fruits

Selection and classification of avocado and mango varieties continues.

Three new avocado selections have been made from among the bearing seedling trees which occur on the coffee plantations in the Kona district. They were selected for their tendency to yield crops between April and June, the time of the year when avocado production is lowest.

Six new mango selections have been obtained from the seedling trees growing in the Honolulu district.

Inbred lines of papaya are under investigation, particular attention being given to the effects of continuous inbreeding. A number of hybrid lines have been selected for testing as possible commercial varieties. These selections have been derived from crosses of Solo with Florida, Wild, Panama, Fairchild and Dillingham. Studies on the inheritance of carpellody of the stamens, and of fruiting height and precocity are in progress; two mutant leaf characters which have appeared in inbred lines of Solo are also being studied.

Macadamia

Selection work among seedling trees is being continued.

Selections on trial in the variety test orchard have been studied with regard to vigour, tree form and productivity; six selections show promise for future varietal distribution.

Lettuce

The Great Lakes and Manoa varieties have been crossed to develop a lettuce which will form a head with good quality at lower altitudes. Early maturing selections which produce solid heads and do not bolt, and which show little tendency to suffer from tipburn have been produced; these are now in the F_4 generation.

Tomato

The spotted wilt resistant Pearl Harbor variety was released in 1945 (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 986). Breeding to develop spotted wilt resistant types with larger fruits than Pearl Harbor is in progress. Several F_7 lines homozygous for resistance to spotted wilt and with large fruits have been derived from the cross (Pearl Harbor x Bounty) x (Pearl Harbor x Pritchard).

Breeding for grey leaf spot (*Stemphylium Solani*) resistance continues.

Further work on breeding for root-knot resistance is reported. By means of the embryo culture technique, five complex interspecific hybrids involving the resistant species, *Lycopersicon peruvianum*, have been grown to maturity. Only one of these, a cross between (*L. hirsutum* x Bonny Best) x (Bounty x BC-10)] and *L. peruvianum* has set fruit with

viable seed. This hybrid has been propagated by stem cuttings. It exhibits field resistance to spotted wilt, grey leaf spot, the green potato aphid (*Macrosiphum solanifolii* Ashm.), and tolerance to mosaic. Crosses between *L. esculentum* and the F_1 of the cross have been unsuccessful. A plant from a cross between *L. esculentum* and an F_2 segregate of the cross proved to be susceptible to nematode. The F_2 generation has segregated for nematode resistance, plant vigour and other characters; still greater segregation has been observed in the F_3 and F_4 generations. Resistance to nematode has behaved as a dominant character. Resistance to mosaic is receiving attention. *L. hirsutum* has shown no symptoms of mosaic in the field, but various interspecific hybrids involving this species have exhibited symptoms. Two F_2 segregates from a cross between (*L. hirsutum* x Bonny Best x Bonny Best) and Pearl Harbor x (*L. esculentum* x *L. pimpinellifolium* x *L. chilense*) show the highest degree of tolerance to mosaic.

Combined resistance to disease is being sought. A description is given of the technique used to test the combined reaction of hybrid seedlings to spotted wilt, grey leaf spot and *Fusarium* wilt. Resistance to each of the three diseases appears to be mainly due to single dominant genes. Evidence has been obtained that some association exists between the factors for resistance to grey leaf spot and those for resistance to *Fusarium*. Work is also being carried out to add resistance to early blight leaf spot disease to the lines showing combined resistance to spotted wilt, *Fusarium* wilt and grey leaf spot. Some indeterminate late maturing lines received from the United States Department of Agriculture and the Florida Agricultural Experiment Station have been used as a source of resistance to early blight leaf spot.

Interspecific hybrid selections involving *L. peruvianum* and showing tolerance or resistance to nematode have been analysed for vitamin C content. The hybrid [(*L. hirsutum* x Bonny Best) x Bounty x BC-10] x *L. peruvianum* has given an ascorbic acid value of 39·7 mg. per 100 grm. as compared with the content of 12·0 mg. given by Bounty. *L. peruvianum* has been found to be heterozygous for the genes controlling vitamin C content. Selections made within the species range between 56·5 and 109·5 mg. in ascorbic acid content; the content of Pearl Harbor varies from 8·5 to 19·5 mg. F_5 selections of the cross between Michigan State Forcing and *L. peruvianum* range from 23·7 to 48·8 mg; these values are higher than those of Bounty and Pearl Harbor but much lower than those of *L. peruvianum*.

Cucurbits

Varieties of water-melon, cantaloupe and cucumber are under observation with regard to melon fly resistance and other characters.

Phaseolus

Promising hybrid selections of pole green beans have been developed, possessing rust resistance.

Sweet corn

Hybrid production is in progress; a few of the single crosses tested show promise of resistance to mosaic and earworm.

41. 575:633:581.056(47)

(The Karabalyk State Breeding Station).

Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : No. 6 : 77–78.

The Karabalyk State Breeding Station was founded in 1938 in the centre of the Transural steppes. A wide range of different crops is being tested for suitability for cultivation in Transuralia, and cold resistant selections of rye, hard and soft wheats and various herbage plants have already been made. The station is also making great efforts to raise the general level of agriculture of the region.

*GENETICS 575.1

42. Jucci, C. 575.1

I fattori ereditari. **(Hereditary factors).**

Soc. Ital. per il Progresso delle Scienze Roma 1940 : Pp. 37.

This pamphlet is a reprint of a lecture read in 1939 at a conference of the Italian Society

* General studies, see also individual crops.

for the Advancement of Science. It deals with the general and basic principles of genetics applied to agriculture and human heredity. A survey of historic theories and misconceptions is given, and present-day theories are also reviewed. Without reaching any conclusions of his own, the author gives a fairly complete outline of the theories and problems of heredity and genetics. E. M. F.

43. 575.1(47)

Genetics and science in the U.S.S.R.

Brit. Med. J. 1947 : No. 4528 : 616–18.

An account is given of Lysenko's genetical system and of the background against which it has emerged. This follows in the main the communication of Hudson and Richens (cf. *Plant Breeding Abstracts*, Vol. XVI, p. 365) and a recent article by Darlington (cf. Abst. 44). Reference is also made to the dissatisfaction expressed by recent writers in the Soviet Union to the genetical views of Žebrak.

44. Darlington, C. D. 575.1(47)

The retreat from science in Soviet Russia.

Nineteenth Century 1947 : **142** : 157–68.

A review is presented of the history of genetics in the Soviet Union from the October Revolution to the present day. The account given follows in the main the monograph by Hudson and Richens (cf. *Plant Breeding Abstracts*, Vol. XVI, p. 365), but additional information is given on the careers of Vavilov, Levitzky, Avdulov, Chetverikov, Efroimson, Algol, Ferry, Levit, Iljin, Karpechenko, Kerkis and Koltzov.

A brief critical summary is given of Lysenko's genetical theories and of the present state of science in the Soviet Union.

45. Darlington, C. D. 575.1(47)

A revolution in Soviet science.

J. Hered. 1947 : **38** : 143–48.

A reprint is given of C. D. Darlington's discussion of genetics in the Soviet Union, which recently appeared in "Discovery" (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 959).

46. Davies, R. G. 575.1(47)

Genetics in the U.S.S.R.

Modern Quart. 1947 : **2** : 336–46.

An extended summary is presented of the monograph by Hudson and Richens on the genetical system associated with the name of Lysenko (cf. *Plant Breeding Abstracts*, Vol. XVI, p. 365). Lysenko's attempt to justify his system by demonstrating its concordance with dialectical materialism is criticized as invalid. The author is of the opinion that Marxism is essentially an induction from observation, and itself develops with the advent of fresh facts. Dogmatic Marxism is stigmatized as a contradiction in terms. It is regretted that Lysenko has received so much support in the U.S.S.R., but it is suggested that the interplay of ideas between Lysenko and Mendelian geneticists may eventually lead to an enrichment in the content of Mendelian theory.

47. Fyfe, J. L. 575.1(47)

The Soviet genetics controversy.

Modern Quart. 1947 : **2** : 347–51.

The theories of Lysenko are criticized on various scores, particularly for their ignoring almost the whole body of recent research in Mendelian genetics. It is emphasized however that Lysenko's experiments cannot be summarily dismissed, and should be repeated under carefully controlled conditions. Recent developments in Mendelian genetics are just as inconsistent with the elementary genetics of the text-books as some of Lysenko's theories. In reply to Darlington's criticism of the state of genetics in the Soviet Union (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 959) it is pointed out that research along Mendelian lines has never been interrupted, and moreover that the occasional appointment of an unsatisfactory scientist is no argument against the advantages of scientific planning as organized in the Soviet Union.

48. Laptev, I. 575.1(47)
Antipatriotic attacks under the flag of "scientific" criticism.
Pravda Sept. 2, 1947 : p. 2.

The author criticizes the attitude of Sax, Žebrak, Dubinin and Darlington to Lysenko and his school (cf. *Plant Breeding Abstracts*, Vol. XIV, Abst. 1125, Vol XVI, Abst. 596, Vol. XVII, Absts 959 and 1025). It is pointed out that Soviet genetics, as developed by Mičurin and Lysenko, is an advanced progressive science, which must be carefully distinguished from the reactionary bourgeois idealist genetics of western Europe and America.

49. Lewis, J. 575.1(47)
A footnote on the Soviet genetics controversy.
Modern Quart. 1947 : **2** : 352–56.

Four questions are discussed:—

(1) Whether Lysenko is right or wrong, (2) has Lysenko received undue support from the Soviet authorities, (3) has scientific objectivity in Russia been prejudiced by ideological considerations, and (4) have Russian geneticists been persecuted.
The author replies as follows:—

(1) Severe criticism of Lysenko's work is general among British and a considerable number of Russian geneticists.

(2) The Soviet authorities have favoured Lysenko on account of his many undoubted contributions to Soviet agronomy. They have also supported the plant breeding work of a number of Lysenko's opponents.

(3) Dialectical materialism represents no more than scientific induction in its widest and most comprehensive form. Recent genetical work supports the dialectical conception of the necessary interaction between genes and their environment.

(4) Research along Mendelian lines has never been stopped in the U.S.S.R.

50. Sirks, M. J. 575.1(47)
Lysenko's genetica. (**Lysenko's genetics**).
Landbouwk. Tijdschr. Wageningen 1947 : **59** : 17–21.

This is an authoritative and critical estimate of Lysenko's contribution to modern genetic theory (cf. *Plant Breeding Abstracts*, Vol. XVI, p. 365) with observations on the views of his predecessors and contemporaries in the fields of philosophy, science and politics in Russia.

51. 575.1(48.5)
Lunds Universitets Årsberättelse 1945–1946. (**Annual Report of Lund University 1945-1946**).
Håkan Ohlssons Boktryckeri, Lund 1947 : Pp. 89.

Among the various activities of the Botanical Museum, mention is made of a study which Gustafsson is making of mutability in various plants (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 707) and of the composition of his monograph on apomixis (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1100, Vol. XVIII, Abst. 104).
The botanical garden has conducted exchange of seed with numerous countries, though not yet with Germany.
Research proceeded as usual at the Genetics Institute, co-operation being maintained with the Swedish Seed Association at Svalöf in regard to experimental material and facilities for work: another small experimental field was available at Lund.
Courses were held in genetics, cytological technique, and statistical analysis of variance and various books on genetics of plants, man or animals were published.

52. 575.1:007
Mendel's 125th birthday anniversary.
J. Hered. 1947 : **38** : 161, 185–86.

A bibliographical note on Mendel is given, in commemoration of the hundred and twenty fifth anniversary of his birth on 22 July, 1822.

53. 575.1:007

Gregor Mendel summarises his results.

J. Hered. 1947 : **38** : 186–88.

Excerpts are printed from the translation made by the Royal Horticultural Society of Mendel's address to the Brno Natural History Society, in which he described his experiments on the pea and formulated the principles of Mendelian inheritance.

54. Iltis, H. H. 575.1:007

A visit to Gregor Mendel's home.

J. Hered. 1947 : **38** : 163–66.

An account is given of a recent visit to the Augustinian monastery, Brno, Czechoslovakia, where Mendel lived and worked, and to the Mendel Museum.

55. Marsden-Jones, E. M. and Turrill, W. B. 575.11:581.46

A quantitative study of petal size and shape in *Saxifraga granulata* L.

J. Genet. 1947 : **48** : 206–18.

The inheritance of petal size and shape was studied in a population of *S. granulata*. The data obtained showed that the general shape of the petals is determined by genes and modified to only a limited extent by environmental factors. At least three groups of genes are concerned, a basic set which determines size and shape in general terms, a set determining femaleness which results in a reduction of petal size, and a set causing abnormalities of the androecium or the petals. So many segregating genes are involved in the basic and abnormal sets that variations in size, shape and abnormalities can be so arranged as to be essentially continuous, and scoring into classes becomes arbitrary. The number of gene loci involved was not determined.

56. Kosswig, C. 575.113.4:576.12

Über Substitutionsgene und Transfer der Genfunktion. (**Substitution genes and transfer of the gene function**).

Experientia, Basel 1947 : **3** : 404–10.

Examples are quoted from fish and *Drosophila* genetics to show that one or more genes may be evolved in an organism, which affect the phenotype in the same way as an already existing gene or genes. Should the older gene system now become modified, the phenotype would remain unaffected, since the newer gene system would maintain it. Moreover, since in the course of divergent evolution, different systems of substitute genes may replace an original system conditioning any particular character, it is possible that any external feature shared in common by two different forms of common ancestry may be determined by different gene systems.

57. Beal, J. M. 575.12:575.182

Some results of cross-pollination on *Lilium regale*.

Bot. Gaz. 1947 : **108** : 526–30.

Attempts to produce hybrids by pollinating *L. regale* with pollen from other species have resulted in plants which show no evidence of hybridity. The pollen tubes entered the ovules through the micropyles and both embryos and endosperm developed at approximately the same rate and in the same way as in selfed *L. regale*. The supposed F_1 hybrids closely resembled the seed parent in all visible characters and showed no greater variability than that exhibited by seedlings resulting from self-pollination. Smear preparations of their microsporocytes showed no meiotic irregularities suggestive of hybridity and their progeny, produced by selfing, did not segregate but appeared to be pure *L. regale*. No explanation has been found for this unusual behaviour.

58. Louis-Marie, P. 575.12:575.22

Le problème de nos dentaires hybrides. (**The problem of our coral-wort hybrids**).

Ann. Ass. Canad. Fr. Advanc. Sci. Montréal 1940 : **6** : p. 101; 1941 : **7** : p. 99.

The probable hybrid origin of four *Dentaria* species is discussed and a biometric treatment

of the problem of *Dentaria* hybrids is reported, as well as a study of the inheritance of certain diseases.

59. 575.12:576.12:581.9
BAKER, H. G. 575.12:576.12:581.5
A note on natural hybridisation, illustrated by reference to *Melandrium dioicum* (L. emend.) Coss. and Germ., and *M. album* (Mill.) Garcke.
Naturalist October-December 1945 : 129–30.

The past and present evolution of *M. dioicum* and *M. album* is discussed with reference to their geographical distribution and ecology. Natural hybridization between the two species and artificial hybridization with other species of the Caryophyllaceae are described. The question of criteria of hybridity is briefly gone into. Reference is made to records of hybridity in various wild plants and it is stated that much undiscovered hybridization awaits disclosure.

60. DELAUNAY [DELONE], L. N. and 575.148:575.42
DIDUSJ, V. I. 575.148:575.242:633.1
(The efficacy of intravarietal selection in line varieties of self-pollinated crops).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : Nos 7–8 : 16–24.

It is pointed out that the concept of a pure line has been applied too rigidly by plant breeders, who have not only tended to overlook the inherent variability remaining even in a long established agricultural variety, and more particularly in one of hybrid origin, but have also ignored the possibility of constantly renewed variability resulting from mutation. An extensive study of mutation in "pure line varieties" of wheat and barley was begun in 1934. In wheat varieties studied, up to 0·14% of clearly evident defective mutants were observed and in barley varieties still more. However, a certain number of fertile, productive mutants were also observed. Mutations occurred in the most varied directions and affected such characters as height of plant, earliness, tillering, chlorophyll and anthocyanin development, glaucousness, disease resistance, and form and quality of grain. The frequency of mutation was found to be much higher than has hitherto been supposed and has convinced the authors of the efficacy of intravarietal selection in improving the qualities of a variety. This has been practised with three varieties of wheat and the results confirmed the supposition. In 1937 an ear was selected from the variety Albidum 30–9 (Novo-Jurjevka) and the wheat obtained from it differs from the original variety in having wider leaves of darker green colour, greater resistance to black chaff, *Septoria* and leaf mosaic, and greater standing capacity. In yield it exceeded the parental variety by 12·9% in the three years 1941, 1944 and 1945, when its average yield was 35·0 c. per ha. as against 31·0 c. for Novo-Jurjevka. The new variety which has been named Harkovčanka exceeded Novo-Jurjevka and all other soft wheats studied in number of spikelets per ear, some ears bearing up to 29; the number of grains per ear was as much as 79 in the best ears. The large number of spikelets per ear was transmitted to some of the hybrids of Harkovčanka, and in hybrids with the variety Lutescens 17 of the Verhnjačka station has been combined with large grain in some exceptionally vigorous wheats. The authors acknowledge that Harkovčanka may be the result of segregation rather than mutation but it is thought most probable that it originated by a combination of both processes.

From the variety Hostianum 237 a number of plants were selected in 1939 as displaying greater standing capacity than the parent variety. One of them has given rise to a new variety, named Zenitka, with straw which, though no thicker, is distinctly stronger than that of Hostianum 237. When this latter variety is completely lodged the straw of Zenitka is only slightly inclined. In all other characters, such as the valuable combination of frost and drought resistance, the two wheats are identical, except that Zenitka has proved superior by 12·8% in yield in the years 1941, 1944 and 1945. In 1941, a bad year for lodging, Zenitka yielded 27·1 c. per ha. as compared with 21·3 for Hostianum 237

A further selection, Hostianum 184/237, with still stronger straw than Zenitka, is under investigation. Both are thought to be products of segregation rather than mutation. In the variety Ukrainka some tens of thousands of plants were examined in 1939 for resistance to brown rust and one resistant family was found. In view of the great uniformity and antiquity of the variety Ukrainka the new form is thought to be undoubtedly attributable to mutation; it has been named Ukrainka Harkovksaja [Kharkov Ukrainka]. In yellow rust resistance it has surpassed all other varieties with which it has been compared; it is somewhat less winter hardy than the original Ukrainka but another selection is now under observation which combines the brown rust resistance with hardiness equal to that of the original Ukrainka.
Ukrainka Harkovskaja differs from Ukrainka also in having stronger straw and larger grains.

61. . 575.17:577.15
575.182
575.061.6:575.24
ADDISON, G. 576.12
The chemical formulation of gene structure and gene action.
Advances Enzymol. 1944 : **4** : 1–39.

The general scope of chemical genetics is indicated. Since the question of the constitution of genes is bound up with the structure of the protein molecule, recent advances in the study of the latter are outlined. Reference is made to viruses which are nucleoproteins and are therefore comparable to the principal material in chromosomes. It is shown, however, that the tobacco virus substance resembles the so-called nucleoproteins of the cytoplasm rather than true nuclear material in the structure of both the nucleic acid and protein constituents and in their relative proportions. But despite other differences, the nucleic acid protein of the tobacco virus resembles that of chromosomes in having the form of very highly polymerized fibres in which the nucleotide units lie crosswise and closely packed.
The behaviour of the nucleic acid and proteins of chromosomes during autosynthesis is considered.
The methods of studying chromosome chemistry and the ways in which purified nuclear material has been obtained by various investigators are enumerated. Modern chemical analyses confirm the early conclusion that chromatin is a compound of nucleic acid with a protein. The nature of the bond which unites them is not certain, as yet.
The author contends that the fact that nucleic acid is not continuously present in all stages of all germ cells provides an argument against considering it an essential part of the differential pattern of a gene, although it does not diminish the probability that it is an essential item in the machinery of gene behaviour. Moreover, the persistent structure of the chromosome depends on its protein and not on its nucleic acid, for chromosomes do not become disorganized when all the nucleic acid is digested away from them. The class of proteins recently designated chromosomin is described.
An outline is given of the probable carbohydrate metabolism of the nucleus.
The nature of enzymes is dealt with, since the functions of genes, it is stated, must be essentially enzymatic. The author's conception of the gene, presupposing a monolayer surface of protein consisting entirely of multiple contact points conforms with the theory that most enzymes operate by virtue of an activating surface which makes a multiple-point contact with the substrate.
Evidence is presented concerning the metallic content of chromatin. Attention is drawn to association of bivalent and trivalent metallic ions with enzymes, but it is pointed out that nothing is definitely known about the value of such elements in the nucleus. The enzyme yield of nuclei appears to be low as compared with the cytoplasm of the same cells. It is suggested that the tendency of the chromonemata to exist in pairs but to resist larger aggregation is comparable to the behaviour of the protein megamolecules which will not grow indefinitely like crystals but close off their molecule after repeating identical parts a certain exact number of times. Explanations put forward by different authors to explain this behaviour of the chromonemata are referred to.

In connexion with the different theories of gene structure, which regard the gene as several molecules, one molecule or just a part of a molecule, the implications of the term molecule as applied to crystal formation are considered. It is concluded that it is still useful to regard a gene as having some of the characteristics implied in calling it one molecule and thus to identify it, hypothetically, with a megamolecule.
It is contended that all genic control must be found within the framework of the two explicit functions of the gene, self duplication according to precise rules and production of a non-genic material, presumably an enzyme protein. In discussing the mode of action of genes, the author tends to favour the hypothesis that each gene produces just a single active principle and that histological differentiation is due to its inducing more or less different results when it works on different cytoplasmic substrates. Apparently the primary products of the genes are formative enzymes representing early links in the chain of processes leading to the later synthesis of the familiar cytoplasmic enzymes.
The factors in the environment of the gene which must influence its metabolic behaviour are considered, and the conclusion is reached that all development, specialization, tissue differentiation and temporal changes observable in the ontogeny of a multicellular organism are accomplished through cytoplasmic specializations, which are responsible for differentiated stable states of the gene-cytoplasm complex, the cytoplasm itself, however, being subject to gene regulation.
Various mutation studies, especially those concerning pigment formation which throw some light on the chemical action of genes, are reviewed.
Experiments on the relation of nucleus to cytoplasm (in animals) are also considered. A discussion is included of the increase during the course of evolution in the number of kinds of genes from the stage in which only one type of gene existed, and of the role played by gene mutation in the evolution of organisms. Special attention is paid to "polyurgic" genes, i.e. genes which produce different effects in different parts of the organism, and to polygenic characters.
A possible explanation of orthogenesis is given on the basis of the hypothesis that a gene mutation may induce comparable alteration in another part of the same gene or perhaps even changes in neighbouring genes. Over-specialization is discussed in the light of this explanation, and it is suggested that the term could mean the possession of indispensable genes which are potentially detrimental.

62. George, W. 575.173:577.15
Genes and development.
Sci. Progr. **1947** : **35** : 447–69.

The relation between genotype and phenotype and the mode of action of genes are discussed. Experiments on *Neurospora* and yeast are cited to illustrate the correlation between genes and enzymes, and work showing a similar correlation between genes and other chemical substances in animals is reviewed. The function of the genes in directing the configurations of protein molecules is considered in relation to the production of enzymes. The connexion between the action of the genes and the amount and distribution of different kinds of nucleic acid in the nucleus and cytoplasm of the cell is also discussed. The examples of the action and interaction of genes in development are taken from the animal kingdom.

63. 575.183.8
Briquet Junior, R. 575.182
Falácias em genética. (**Fallacies in genetics**).
Ceres, Brasil **1944** : **5** : 302–12.

This paper, mainly zoological, discusses various popular notions discountenanced by modern genetics, in particular, telegony. Xenia is also considered.

VARIATIONS, MODIFICATIONS, MUTATIONS 575.2

64. Gourlay, W. B. 575.2
The lost scent of *Mimulus moschatus*.
J. R. Hort. Soc. **1947** : **72** : 285–87.

The scented form of *M. moschatus* occurred among plants grown by the Royal Horticultural Society from seed introduced in 1826 from North-west America. The author suggests

that if, as seems likely, this "sport" arose from one seed only and was subsequently reproduced by vegetative means only, the well-known disappearance of the scented form is less surprising than its appearance. Seedlings, it is pointed out, might be expected to revert to the scentless form. Evidence has also come to hand of the separate occurrence of a scented form a long time ago at Millstream, British Columbia.

65. Louis-Marie, P. 575.2
Essai de classification de variations de trille. (**An attempt to classify the variations of *Trillium***).
Ann. Ass. Canad. Fr. Advanc. Sci. Montréal 1940 : **6** : 100–01.
A description of 38 different *Trillium* mutants collected in the West of Quebec, and a catalogue of all the known variations in four *Trillium* species is reported. The origin of the numerous variations is discussed.

66. Ridley, H. N. 575.2
The scent of *Mimulus moschatus*.
J. R. Hort. Soc. 1947 : **72** : p. 373.
A further note is contributed on the scent of *M. moschatus* (cf. Abst. 64). The brief communication reports the transitory occurrence of the musk scent. Seedlings observed in Dorset during 1941 exhaled a fairly strong scent when about $1\frac{1}{2}$ inches tall. When the seedlings were 4–6 inches high the scent completely faded out.

67. Pereira, C. and
Castro, M. P. de 575.22
Sobre o equilíbrio genético estavel. (**Stable genetic equilibrium**).
Arch. Inst. Biol. Def. Agric. Anim. S. Paulo 1946 : **17** : 267–68.
Brief consideration is given to the advantages to be gained from inferring the genetic equilibrium in a population from Mendelian principles by means of the binomial law.

68. Kotval, J. P. and
Gray, L. H. 575.243:537.5
Structural changes produced in microspores of *Tradescantia* by α-radiation.
J. Genet. 1947 : **48** : 135–54.
Pollen grains of *T. bracteata* were subjected to irradiation by α-particles by immersing the anthers in radon solutions. The structural changes seen at metaphase twenty-four hours later are described. These changes were similar to those seen at the same interval after γ-ray, X-ray and neutron treatment and are classified as chromatid breaks, isochromatid breaks and interchanges. The number of changes of each type is directly proportional to the dose. The proportion of structural changes in which fusion of the broken chromatid ends is incomplete exceeds that observed previously with other types of radiation. The relatively large number of structural changes produced by a given dose of α-radiation suggests that those α-particles which pass close to the chromatid thread as well as those which pass through it have a significant probability of breaking the thread. α-rays from the radioactive constituents of living matter and its immediate environment are considered as a possible source of spontaneous chromosome aberrations in nature.

69. Fano, U. 575.243:537.531
Note on the theory of radiation-induced lethals in *Drosophila*.
Science 1947 : **106** : 87–88.
A criticism is presented of various points in the theory of radiation-induced lethal mutation put forward by Lea and Catcheside (cf. *Plant Breeding Abstracts*, Vol. XVII, p. 350 and Abst. 1388). In particular, the author calculates that the frequency of recessives should increase slower than in proportion to the dose by at least 20% at 3000r. A non-linear effect of this magnitude is not observed experimentally, and is regarded as an obstacle towards accepting the theory of Lea and Catcheside.

70. 575.41:576.12
KIRPICHNIKOV [KIRPIČNIKOV], V. S. 575.3:576.12
The problem of non-hereditary adaptive modifications (coincident or organic selection).
J. Genet. 1947 : **48** : 164–75.

An outline is given of the development of theories concerning the interrelation of non-hereditary adaptive modifications and natural selection. Recent views on the subject expressed by Russian and other scientists are discussed and the evidence for the hypotheses of coincident and stabilizing selection is reviewed.

71. ROUSSEAU, J. 575.79:632–1.521.6
Notules ethnobotaniques.—2. Pourquoi les ancêtres de certaines plantes cultivées sont disparus? (**Ethnobotanical notes.—2. Why have the ancestors of certain cultivated plants disappeared ?**)
Ann. Ass. Canad. Fr. Advanc. Sci. Montréal 1938 : **4** : p. 113.

The author presents the hypothesis that the cultivation of certain species has facilitated the multiplication of the organisms attacking them, and that while the cultivated forms were protected to some extent from these organisms the wild varieties were exterminated by them.

ORIGIN OF SPECIES 576.1

72. KROGH, C. VON 576.1:1
Immer wieder : Abstammung oder Schöpfung? (**Once again: Descent or Creation**).
Biologe 1940 : **9** : 414–17.

The views of Frieling, Kuhn, Bergdolt, Gehlen and Zündorf on evolution are criticized. The authors quoted are said to have rejected neo-Darwinism, largely because its materialist presuppositions run counter to the philosophy of German national socialism. It is suggested by way of rebuttal that monism has been the philosophy *par excellence* of the nordic race for the last thousand years.

73. BERGDOLT, E. 576.12
Über Formwandlungen—zugleich eine Kritik von Artbildungstheorien. (**Changes in form—also a critique of theories of species formation**).
Biologe 1940 : **9** : 398–407.

A criticism is presented of the neo-Darwinian theory of evolution. It is pointed out that modifications of specific or even generic magnitude can be induced in such plants as hepatics, *Viola* sp. and *Acacia* sp. by experimental means. Furthermore, it is not possible to account for organic diversity by means of natural selection alone, since many morphological characters lack adaptive significance, and it cannot always be assumed in these cases that they are linked to adaptive characters.
The evidence for the phylogenetic relationships postulated between the major groups of plants is regarded as unsatisfactory.

74. HAASE-BESSELL, G. 576.12
Evolution. (**Evolution**).
Biologe 1941 : **10** : 233–47.

A general review is presented of evolutionary theory to-day. Among the topics considered are the relative importance of large and small mutations, isolation mechanisms, polyploidy, the genetics of populations, speciation, the significance of so-called directive mutation, and the significance of evolutionary theory for human society.

75. ZIMMERMANN, W. 576.12
Über phylogenetische Methoden. (**Phylogenetic methods**).
Biologe 1941 : **10** : 47–49.

A criticism is presented of Bergdolt's approach to phylogenetic problems (cf. Abst. 73). In particular, the author deprecates Bergdolt's stigmatizing phylogenetic morphology as speculative, and also his minimizing the role of natural selection.

76. *Dvorjankin, F. A. 576.12:575.3(47)
(The philosophy of treasure hunting in breeding).
Selekcija i Semenovodstvo (Breeding and Seed Growing) **1946 : 13 :** Nos 7–8 : 3–15.

The author criticizes an article by Kupcov, in which the views of Lysenko, Mičurin and their disciples are classed as reversions to Lamarckism. It is emphasized that Mičurin's use of hybridization differs radically from the Mendelian use, in that it utilizes the effect on the character of a young seedling of environmental influences and of the mentor, and the shattering effect of crossing upon the hereditary constitution.

Mendelian geneticists, including Muller, are criticized for holding that evolution is a mere process of sieving already existing units, and for believing that natural selection is incapable of creating anything new. These views are held to amount to a belief in autogenesis. The idea expressed by Kupcov that new ecotypes aggravate the struggle for existence in old cenoses is stigmatized as undisguisedly Malthusian. Kupcov is stated not to understand that the basic factor in evolution is the capacity of the organism to select those environmental factors which correspond to its requirements, and reject those that do not, thus bringing about changes corresponding directly to the changes exerted in the environment applied, and in the desired direction.

Kupcov is also criticized for adhering to the mutation theory of de Vries, and is accused of propounding Cuvier's theory of catastrophes and the Batesonian theory of the law of homologous variations. He has also said that it is useless to try and create winter hardy wheats for Siberia or more southern apple varieties for the north. Kupcov is also said to believe in the fixity of Linnaean species.

It is suggested that if Soviet breeders had followed Kupcov's advice, Mičurin's achievements would never have been made.

77. Lysenko, T. D. 576.12:575.3(47)
(On the "Crooked Mirror" and certain "Darwinians").
Agrobiologija (Agrobiology) **1946 : No. 3 : 151–53.**

In his reply to Žukovskiĭ's criticism (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 584) of his article on "Natural selection and intraspecific competition" (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 585), Lysenko accuses Žukovskiĭ of ignorance of Darwinism, and unfamiliarity with the writings of Darwin, Marx, Timirjazev and other authorities, and by a series of quotations from Darwin and Timirjazev attempts to prove that Žukovskiĭ has distorted his, Lysenko's, statements and meaning.

78. 576.12:632.2:581.143.32
Werth, E. 632.2:575.2
Grundsätzliches zum Problem der Gallenbildung und zur allgemeinen Phytopathologie. **(Basic principles relating to the problem of gall formation and to phytopathology in general).**
Festschrift zur Feier des achtzigsten Geburtstages von Otto Appel Berlin-Dahlem **1947 : 3–6.**

Plants react to parasitic attack by normal physiological processes. In the case of *Euphorbia Cyparissias* the form of the gall which appears is shown to be related to the plant's stage of development when infected; the author holds that infection acts as a regulating stimulus in the ontogenetic development, with the result that the formative genetic factors control the form which the gall takes. The cone-like galls of the pine and the acorn-like galls of the oak indicate that it is the normal hereditary potentialities conditioning fruit formation which are brought into action in the production of either a normal fruit or a gall.

The organs of a plant which do not participate in the ordinary developmental processes, but which form the galls, must be potentially present in the hereditary material (Erbgut) for the infecting organism to provoke their evolution. Hence the author's hypothesis that the genetic bases of many organs are latent in the plant though not developed in normal ontogenesis, these organs being considered to be either variants of present-day normal organs (cf. galls caused by *Andricus* and *Chermes*) or reversions to phylogenetically

* An extended summary of this paper is on file at the Bureau.

older conditions. In the author's view the genetic bases do not represent rigid forms or characters but functional or formative potentialities having dynamic rather than static qualities. On this supposition the variability of gall forms in different varieties of host plant or in different developmental stages of one plant becomes understandable. Types of gall parallels, e.g. *Andricus* bud galls and *Neurotirus* leaf galls, differing only slightly from each other, support this theory. E. W.

79. KAVANAU, J. L. 576.15
Some physico-chemical aspects of life and evolution in relation to the living state.
Amer. Nat. 1947 : **81** : 161–84.

The way in which life may have evolved from non-living matter is considered. It is thought unlikely that self-duplicating molecules can be regarded as the first forms of life, especially as self-duplication of nucleoproteins is an endothermic process. Organization is therefore regarded as the fundamental property of living systems, and the conditions necessary for the emergence of organized molecular systems are outlined. Special emphasis is laid on the possible importance of diurnal temperature fluctuations in this connexion. The possibility that the autotrophic bacteria represent the most primitive form of life is discussed sympathetically. It is also suggested that life may be arising *de novo* at the present time.

80. 576.16
SCHWANITZ, F. 577.6
Ein Kreuzzug gegen die Abstammungslehre. (**A crusade against the theory of descent**).
Biologe 1940 : **9** : 407–13.

Criticism is made of the racial theories of Muck, Süssenguth, Classen, Fritsche and Wetzel, all contributors to the journal *Natur und Kultur*. Muck in particular is criticized for a theory of evolution by species transformation (Artumbildung), in which vitalist concepts are introduced.

The author deprecates Muck's accusation that neo-Darwinism is an extension of the liberal postulate of human equality to the organic world in general. Muck is dissatisfied with genetics on account of its providing an insufficient basis for racial discrimination, replacing, in his opinion, an adequately defined racial theory by an unsatisfactory theory of racelessness (Rasselosigkeit).

81. ZIMMERMANN, W. 576.16
Grundfragen der Stammesgeschichte, erläutert am Beispiel der Küchenschelle. (**Basic questions of phylogeny, illustrated by reference to the pasque flower**).
Biologe 1941 : **10** : 404–14.

An account is given of the way in which mutation within populations of organisms leads to racial diversity and eventually to specific and higher taxonomic differentiation. The role of natural selection in this process is indicated. The author takes as his examples the European races of *Anemone Pulsatilla*.

*CYTOLOGY 576.3

82. FLOVIK, K. 576.3:633:575
Cytologi og planteforedling. (**Cytology and plant breeding**).
Meld. Stat. Forsøks. Holt 1939 (1940) : H30–H41.
Meld. Stat. Forsøksstasjoner Plantekult 1939 (1941).

This thesis, presented for the degree of doctorate at the Norwegian Agricultural College in 1939, surveys fully the existing knowledge about natural and induced changes in chromosome number and structure in relation to the breeding of plants and forest trees. The practical importance of cytology as a means of plant improvement is clearly demonstrated (cf. *Plant Breeding Abstracts*, Vol. VI, Absts 1143 and 436).

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* General studies, see also individual crops.

83. 576.312.3:575.242:635.62
BHADURI, P. N. and 576.312.3:575.242:633.528.2
BOSE, P. C. 576.312.332
Cyto-genetical investigations in some common cucurbits, with special reference to fragmentation of chromosomes as a physical basis of speciation.
J. Genet. 1947 : **48** : 237–56.

Data on the numbers and morphology of the chromosomes of the following species are presented and discussed: *Cucumis sativus* L., *C. Melo* L., *Trichosanthes dioica* Roxb., *Luffa aegyptiaca* Mill., *L. acutangula* M., *Coccinia indica* W. et A., *Momordica charantia* L., *Cucurbita maxima* Duch. and *Benincasa cerifera* Savi. Most of them have an unusually high number of satellites and secondary constrictions, some of the chromosomes having satellites at either end. It is suggested that fragmentation of chromosomes at the secondary constrictions has increased the number of chromosomes, satellites and nucleoli in different members of the family. Fragmentation of chromosomes thus provides a physical basis of speciation.

Coccinia indica has sex chromosomes of the XY type. The X chromosome, which is three times bigger than the autosomes, has a nucleolar constriction and the Y chromosome is probably also nucleo-genic because the heteromorphic XY pair has often been found attached to the fused nucleolus during diakinesis.

84. MITRA, J. 576.312.32:576.354.4:633.854.78
A contribution to the embryology of some Compositae.
J. Indian Bot. Soc. 1947 : **26** : 105–23.

The literature on the cytology of the Heliantheae and Eupatoreae and on the cytology and genetics of the Astereae is reviewed. In an account of the embryology of four species belonging to these tribes, the author describes meiosis in the microsporogenesis of *Mikania scandens* Willd., *Ageratum conyzoides* L., and *Grangea maderaspatana* Poir. The haploid chromosome numbers of these were found to be 19, 9 and 20 respectively, *A. conyzoides* evidently being a polyploid since 10*n* chromosomes had previously been recorded for it. Lagging bivalents and univalents were frequently observed at anaphase I in *M. scandens*. These were excluded from the daughter nuclei. The morphology of the somatic chromosomes of *M. scandens* is described.

85. ROSEN, G. VON 576.312.32:578.65
A rapid nigrosine method for chromosome counts applicable to growing plant tissues.
Nature, Lond. 1947 : **160** : 121–22.

This technique has already been described elsewhere (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1556).

86. MALHEIROS, N. and
CASTRO, D. DE 576.312.34
Chromosome number and behaviour in *Luzula purpurea* Link.
Nature, Lond. 1947 : **160** : p. 156.

L. purpurea has $2n = 6$ chromosomes. Two terminal centromeres are apparently present in each chromosome. At anaphase, the chromosomes become U-shaped, with their ends facing the poles.

87. SWANSON, C. P. 576.312.34
X-ray and ultraviolet studies on pollen tube chromosomes. II. The quadripartite structure of the prophase chromosomes of *Tradescantia*.
Proc. Nat. Acad. Sci. Wash. 1947 : **33** : 229–32.

Diagrams are presented of half-chromatid exchanges, a half-chromatid deletion and a metaphase chromosome with four strands in the centre region, all of which have been observed in the pollen tube nuclei of *Tradescantia*. The author discusses why, in view of this evidence for the existence of four stranded prophase chromosomes, the chromatid should act as the functional unit in crossing-over and coiling.

88. YAMAHA, G. 576.312.34
(How to observe chromonemata).
Bot. and Zool. 1939 : **7** : p. 111.
Mention is made of Straub's discussion of the spiral structure of chromosomes and of the technique used by him and other investigators, including Kuwada and Nakamura (1933) in examining the chromonema. Other Japanese cited as contributors to the study of this problem are Kuwada and Wada.

89. THODAY, J. M. and READ, J. 576.312.36:537.531:635.651
Effect of oxygen on the frequency of chromosome aberrations produced by X-rays.
Nature, Lond. 1947 : **160** : p. 608.
A preliminary report is given of experiments demonstrating the effect of oxygen supply on the radiosensitivity of roots of *Vicia Faba*, and of further experiments to test Gray's hypothesis that the lethal effect of ionizing radiations on the growing root tip of *V. Faba* is due to the genetic abnormalities which result from the division of cells containing aberrant chromosomes. The results of the first series of experiments clearly illustrate a reduction of the inhibiting effect of X-rays by anaerobic conditions during irradiation. Results so far obtained in the second series are in agreement with the hypothesis stated above. It has been shown, also, that chromosome aberrations are much less frequent in material irradiated under anaerobic conditions than in the presence of oxygen.

90. JEFFREY, E. C. 576.32
The nucleus in relation to heredity and sex.
Science 1947 : **106** : 305–08.
The general function of the nucleus in the cell, and the limitations imposed by cytological technique on the study of the nucleus are discussed. Present day knowledge of the minute structure of the chromosomes and corresponding details of their behaviour are reviewed, and it is stated that X and Y chromosomes in insects cannot be in any sense regarded as sex determinants.

91. SUBRAMANIAM, M. K. 576.352:576.356.5
Is the macronucleus of Ciliates endopolyploid ?
Curr. Sci. 1947 : **16** : 228–29.
The author has recently reported that endopolyploidy is to be found in fermenting yeast cells (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1395). A discussion is now given of observations by Sonneborn and other investigators which have bearing upon the possible endopolyploid nature of the macronucleus of Ciliates.

92. HOFFMAN, J. G. 576.353:581.143
Wright's hypothesis: its relation to volume growth of tissue cells and mitotic index.
Science 1947 : **106** : 343–44.
The use of Wright's hypothesis, concerning the ratio of the time taken by the different phases of mitosis to the total time of mitosis, to obtain information about the volume growth and frequency distribution of volumes, cells and the rate of growth of a tumour mass, is explained.

93. HEUTS, M. J. 576.356.2:581.032:575.41
Influence of humidity on the survival of different chromosomal types in *Drosophila pseudoobscura*.
Proc. Nat. Acad. Sci. Wash. 1947 : **33** : 210–13.
Larvae of *D. pseudoobscura* differing in the order of the genes in the third chromosome, differ also in their adaptability to various humidities. The order of adaptation is reversed at low and high humidities respectively.

94. 576.356.5
575.17
575.24
576.12

Balzli, J.
Mutation et gigantisme. **(Mutation and gigantism).**
Rev. Int. Soya 1943 : **3** : 161–62.

The occurrence of mutations in nature is discussed with reference to evolution. The colchicine technique for inducing polyploidy is briefly described and the effects of polyploidy indicated. In a discussion on the nature of genes, the ways in which they resemble viruses are pointed out.

95. Kihara, H. 576.356.5
(A survey of studies on polyploidy).
Bot. and Zool. 1939 : **7** : 123–28.

A historical survey is given of research on polyploidy with comments on terminology and definitions of the phenomenon and on its cytological basis. The significance of homology of the chromosomes in regard to polyploidy and methods of inducing polyploidy in plants and animals are also treated.
Among the Japanese investigators cited are Ozawa, Tawara, Kihara and Ono.

96. Witkus, E. R. and 576.356.5:575.25
Berger, C. A. 576.312.38
Polyploid mitosis in the normal development of *Mimosa pudica*.
Bull. Torrey Bot. Cl. 1947 : **74** : 279–82.

Tetraploid divisions are reported in the root meristem of *M. pudica* seedlings. A paired arrangement of the chromosomes observed at prophase is taken to indicate that the tetraploid condition arose by a double reproduction of the chromosomes in the preceding resting stage. It is thought probable that these cells undergo only one division as tetraploids before becoming differentiated. Tetraploid divisions were also observed in the large cortex cells of the shoots of young seedlings.
Somatic pairing of the chromosomes in diploid cells is reported and is illustrated by photomicrographs.

97. Lefèvre, J. 576.356.5:581.04
Notes de biologie végétale. II.—Cytogénétique. **(Notes on plant biology. Part II. Cytogenetics).**
Ann. Inst. Nat. Agron. 1939 : **31** : 29–46.

An account is given of the general characteristics of autopolyploids and allopolyploids and their origin under natural conditions. Various methods of inducing polyploidy artificially are discussed, and the effects of colchicine on meiosis are described. Mutations with visible effects have been brought about by very diverse methods of treatment, and various effects have been produced in one and the same plant. The author points out that the use of colchicine does not yet constitute an easy and certain method for the regular production of tetraploids as is commonly thought. The production by means of other substances of effects similar to those obtained by treatment with colchicine is discussed. The author then deals with the possible applications of these new methods to cultivated plants, and observes that if it were possible to reduce the number of chromosome sets so as to produce a haploid and then to convert this into a diploid by doubling the chromosomes, a completely homozygous plant would be produced.
Comparisons are made between the action of phenylurethane and colchicine, and between that of anethol and substances of the colchicine group.

98. Miller, O. H. and
Fischer, L. 576.356.5:581.192
Comparative analyses of normal and tetraploid *Datura stramonium* and *Datura tatula*.
J. Amer. Pharm. Ass. Sci. Ed. 1946 : **35** (1) : 23–27.

Tetraploids of *D. Stramonium* and *D. Tatula* were produced by soaking the seeds in colchicine solution. Plants of the second and third generations of their tetraploid progeny,

excluding any unbalanced mutants with an excess or deficiency of chromosomes, were then compared with diploids of the same strain, grown as controls, as regards morphology, development, weight of air dried seeds, moisture content of fresh leaves including petioles, total ash and acid-insoluble ash content of leaf blades, petioles and stems, total alkaloids in leaf blades, petioles, stems, roots, immature capsules and ripe seeds, and the composition of the alkaloid mixture in the leaf blades. The tetraploids had leaves about twice the size of the diploid leaves but only about half as many per plant. Flowers, seeds and pollen of the tetraploids were also larger than those of the diploids but there was little difference in the sizes of the whole plants. The relation between the alkaloid contents of the leaves of the two species was different in two different years. Tetraploids of both species were considerably richer in alkaloids in most parts of the plant. The character of the individual alkaloids in the leaves was not significantly altered by tetraploidy. The moisture content of the fresh leaf blades and petioles was very slightly higher in the tetraploids than in the diploids. There was no appreciable difference in total ash and acid-insoluble ash content of the leaves, petioles and stems.

99. BERTALANFFY, L. VON 577.6
Die organismische Auffassung und ihre Auswirkungen. (**The organism concept and its consequences**).
Biologe 1941 : **10** : 247–58, 337–45.

Reasons for treating organisms as unities and not as mere molecular aggregates are put forward. Organisms are regarded as "open" systems in dynamic equilibrium. Morphogenesis and the harmonious subordination of organic parts in an ordered hierarchy within the whole are considered inexplicable without the organism concept. Similarly equifinality, the attainment by organisms of the same final form even though the course of ontogeny may be modified experimentally, is adduced as further evidence for the same point of view.

Plant communities or biocenoses, especially forests, may also be regarded as single organisms, as may the modern political state and the universe itself.

The author dissociates his theory from holism and disclaims any dependence of it on vitalism.

*BOTANY 58

100. 581.141:576.37:575.127.2
BRINK, R. A. and 581.483
COOPER, D. C. 581.3
The endosperm in seed development.
Bot. Rev. 1947 : **13** : 423–477, 479–541.

The formation of the female gametophyte in Angiosperms is described with special reference to cases in which the gametophyte nuclei differ qualitatively. The origin, hereditary make-up, development and function of the endosperm are discussed. It is shown that the endosperm of gymnosperms should not be compared with that of angiosperms. A discussion is included of seed development following interspecific hybridization. Evidence is brought together concerning the effect of abnormal endosperm development on the growth and survival of the embryo in the various families in which it has been studied.

The different kinds of hereditary alteration in balance between endosperm, embryo and maternal tissue and of developmental conditions which lead to seed abortion are discussed. The relations between pollen tube growth, inherent potentiality of the embryo and the fertility of hybrids on the one hand and seed development on the other are considered. The literature on xenia and metaxenia and on hybrid vigour of the endosperm and endosperm mosaics in maize is reviewed.

The possible connexion between double fertilization and polyploidy is discussed. The various kinds of parthenogenesis and apogamy are considered with reference to endosperm development.

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* General studies, see also individual crops.

It is shown how artificial culture of excised embryos has shed light on the function of the endosperm.

101. Bloch, R. 581.143.24:575.182
Irreversible differentiation in certain plant cell lineages.
Science 1947 : **106** : 320–22.

Theories concerning histological differentiation are discussed.
Observations of *Ricinus communis* are reported which suggest that the persistence of cellular characters in somatic lineages in animals has its counterpart in plant cells. It is suggested that the behaviour of the secretory cells in *Ricinus* involves a change in their cytoplasmic system in which control exerted by determinants in the nature of plasmagenes plays a role. Some possible causes of the complex pattern of differentiation and physiological reactivity are suggested.

102. 581.162.32:635.15
Bateman, A. J. 581.162.32:633.42
Contamination of seed crops. I. Insect pollination.
J. Genet. 1947 : **48** : 257–75.

After reviewing previous work on the effects of isolation distance on the contamination of crops by foreign pollen the author describes his own experiments, designed to study the effects of the following four factors affecting cross-pollination between varieties: the breeding system of the species, the isolation distance, the number of plants of the tested variety growing together, and the pollinating agent. The effect of distance isolation on the contamination of one variety by another is recorded for distances up to 580 ft for radishes and turnips, two insect-pollinated, self-compatible species. The data are treated statistically and show that constant increases in distance produced progressively smaller decreases in contamination. It was found that the number and arrangement of plants growing together were as important as and similar to isolation distance in their effect on contamination. It is shown that when pollinating insects are free to distribute themselves over a crop, density of planting has no effect on the rate of decrease of contamination with increasing isolation distance.

103. 581.162.5
Lewis, D. 575.17
Splitting the gene.
Discovery 1947 : **8** : 168–73.

An outline is presented of incompatibility systems in plants. An account is also given of the author's work on the mutant gene S'_6 in *Oenothera organensis*, from which he concludes that gene S_6 from which it arose is compound, part only being affected by mutation to S'_6 (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1365).

104. Gustafsson, Å. 581.163
Apomixis in higher plants. Part II. The causal aspect of apomixis.
Acta. Univ. Lund. 1947 : **43** : 71–178.

Part II of this comprehensive review of the nature of apomixis (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1100) contains chapters on chromosome numbers and meiosis in apomictic breeding systems, the genetical background of apomixis, the physiological basis of apomixis, and apomixis in relation to sexual reproduction, dioecism and self-sterility.

105. Fagerlind, F. 581.163:576.356
Makrosporogenese und Embryosackbildung bei Agamospermischen *Taraxacum*-Biotypen. (**Macrosporogenesis and embryo-sac formation in agamospermic *Taraxacum*-biotypes**).
Svensk Bot. Tidskr. 1947 : **41** : 365–90.

The mode of development of the embryo in apomictic *Taraxacum* forms is described. In most cases, sporogenesis is characterized by asyndetic meiosis, leading to the formation of an unreduced restitution nucleus, an unreduced dyad and so to the embryo.

106. STUIVENBERG, J. H. M. VAN 581.163:577.17:633
Enkele recente toepassingen van plantengroeistoffen en verdere perspectieven. **(Some recent uses of plant growth substances and further prospects).**
Landbouwk. Tijdschr. Wageningen 1946 : **58** : 513–33.

This report of a lecture discusses work on the use of growth substances (1) to induce parthenocarpy in tobacco, *Ilex opaca*, strawberries, tomatoes, apples, pears, cherries and citrus fruits; (2) to prevent late fruit drop in apples and pears (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1287); (3) to promote ripening of fruits (e.g. apples and pears) on the tree or after harvesting; (4) in the storage of potatoes for seed or for consumption and possibly also in onion storage; and (5) to alter the time of flowering of fruit trees and stimulation and retardation of the flowering process in ornamentals intended for cutting.
Various other possibilities discussed include a suggestion received from an anonymous source that the vegetative cycles of the soya bean could be shortened by hormone treatment; and also the regulation of fermentation in breeding and weed control by the same means. There are an extensive bibliography and a report of the stimulating discussion which followed the lecture.

107. MAHESHWARI, P. 581.331.1
Tetranucleate embryo sacs in Angiosperms.
Lloydia, Cincinnati 1947 : **10** : No. 1 : 1–18.

The present state of knowledge about the different types of embryo-sacs found in angiosperms is reviewed. Established cases of tetranucleate embryo-sacs are of two types, monosporic, arising from a single megaspore of the tetrad by two divisions, and tetrasporic, in which three of the four megaspore nuclei, which are unseparated by walls, fuse together so that two nuclei are formed and these two each divide to give the tetranucleate condition. A bisporic tetranucleate embryo-sac has been reported but this needs confirmation. The nuclear behaviour in the embryo-sacs of *Cypripedium* and *Clintonia* is discussed.

581.331.2:581.02
108. GOLUBINSKIĬ, I. N. 581.331.2:581.04
(Influence of pollen mixtures and density of pollen on its germination).
Agrobiologija (Agrobiology) 1946 : No. **3** : 59–70.

A great number of factors such as purity of reagents, of vessels and of the atmosphere, temperature, climatic conditions, etc., which may influence the results of pollen germination are enumerated. The rootstock on which a variety is grown may also influence the germinating capacity of its pollen; thus tables are given which show that pollen of Mičurin's Winter Beurré pear germinates best when it is grown on its own roots, less well when grown on wild pear, less still on quince, and worst of all when grown on wild apple.
Experiments were made to test the influence of pollen density; germination tests were made in a medium of 15% sucrose in distilled water; two drops of solution containing many, an intermediate number and few pollen grains were introduced into a Petri dish and kept in the light at a temperature of 22–24° C. Over 30 species were tested and 15 germinated; in all cases there was a clear correlation between the number of pollen grains in the drop and both the germination percentage and the length of the pollen tubes, though the degree of the effect was different in different species. The most pronounced effect was observed in *Digitalis* spp., *Medicago sativa* L., *Linaria vulgaris* Mill. and *Datura Stramonium* L.; this last named species germinated only when the pollen was above a certain density.
In experiments with mixtures of pollen from different species, with certain combinations of species there was a mutual stimulation of both germination percentage and length of pollen tube, in other combinations there was a stimulation in only one of the species involved, in others again no stimulation of either; in certain combinations a retarding or inhibiting effect of one species on the other was observed. The precise effect obtained was influenced also by the proportion of the pollen of the respective species present.
Attempts to extract the stimulating substance from the pollen grains in aqueous solution have not yet been successful; addition of small quantities of certain chemicals such as $KMnO_4$ and KBr resulted in increased rates of germination of hop pollen, the best concentrations being from 0·005 to 0·001%.

109. FISHER, R. A. and
MARTIN, V. C. 581.466:576.356.5
Spontaneous occurrence in *Lythrum salicaria* of plants duplex for the short-style gene.
Nature, Lond. **1947** : **160** : p. 541.

The tetrasomic inheritance of the factor for mid style in purple loosestrife has been confirmed. It seems therefore that the 60 chromosomes comprise fifteen quadruplets of homologous chromosomes. The mid style gene appears to be completely dominant. It has been shown that simplex short plants produce, by double reduction, a minority of duplex gametes. A study of the relation between the genes for short style and for purple flowers has been started. It is concluded that wild cross-pollinated populations must contain fifteen different genotypes in respect of the factors for mid and short style, and the approximate relative frequencies of the different categories expected in nature are given.

110. MASON, H. L. 581.9:581.02
The edaphic factor in narrow endemism.
Madroño **1946** : **7** : 209–26, 241–57.

A criticism is presented of the many attempts made to account for endemism along purely historical lines, i.e. interpreting endemics either as new species or relics. Similarly isolation in itself is shown to be a purely negative concept, insufficient to provide a positive explanation of endemism.

In contrast to the over-abstract approach to endemism, the author points out that the habitats of many endemics are often characterized by unusual conditions, in particular by highly mineralized soil. Examples of endemics are quoted from the Californian flora to show that adaptation to unusual edaphic conditions provides a better solution to the problem of their restricted occurrence than abstract considerations based on the age of the species.

111. CAMP, W. H.,
RICKETT, H. W. and
WEATHERBY, C. A. 582:001.4
International Rules of Botanical Nomenclature.
Brittonia **1947** : **6** : 1–120.

The International Rules of Botanical Nomenclature, as revised at the International Botanical Congress at Amsterdam, 1935, are set out. Appendices follow on Regulations for Determining Types, *Nomina Familiarum Conservanda* and *Nomina Generica Conservanda*.

112. GIBBS, R. D. 582:581.192
Comparative chemistry as an aid to the solution of problems in systematic botany.
Trans. Roy. Soc. Can. **1945** (**1946**) : **39** : Sect. **5** : 71–103.

The importance of chemistry in taxonomy is illustrated by a discussion of the distribution of nitrogenous anthocyanins, the anthocyanins of *Tulipa*, the fats of two tribes of the Flacourtiaceae and the comparative chemistry of the Cupressaceae.

*DISEASES AND INJURIES, BACTERIA, FUNGI 632

113. †NIZENJKOV, N. P. 632.111–1.521.6:578.08(47)
632.112–1.521.6:578.08(47)
(Application of an electrical method in breeding).
Selekcija i Semenovodstvo (Breeding and Seed Growing) **1946** : Nos 9–10 : 34–42.

It was found that two needles, one steel and the other nickeled steel, when immersed in living plant tissue and connected through a galvanometer, deflected the needle. Experiments showed that the electromotive force produced was directly correlated with the water content of the tissue. Under comparable conditions the E.M.F. differed in different

* General studies, see also individual crops.
† An extended summary is on file at the Bureau.

varieties and was found to be higher in frost resistant than in susceptible wheat varieties. When plants are subjected to frost, the E.M.F. gradually diminished and when the iso-electric point of the protoplasm is reached it disappears altogether. This critical point occurs at different temperatures in different varieties. The critical temperatures were determined for winter wheat varieties from a formula based upon the data from two determinations of the E.M.F. at two different temperatures, and the plants were subjected to temperatures approaching the calculated critical ones. The results of the test showed general agreement with the calculated critical temperatures.

Experiments were also carried out to test the correlation between drought resistance and E.M.F. in winter and spring wheat varieties. The more resistant varieties attained their maximum E.M.F. at relatively higher critical temperatures than less resistant varieties. In general, the varieties possessing the highest drought resistance have the lowest E.M.F. There were, however, exceptions, and some varieties combined both drought resistance and frost resistance, e.g. Hostianum 237. Further investigations have shown that the alterations of the E.M.F. with changes of temperature provide a better criterion of drought resistance than the absolute values.

The use of the electrometric method is recommended for selection for frost and drought resistance within varieties, for assessing varieties according to drought resistance, and for rapidly determining the critical freezing temperature of a variety without the use of a freezing chamber. The method can also be used for estimating sugar content in sugar beet, and oil content in seeds. By its application two new varieties have been produced by selecting from the winter wheat Ukrainka 246; one, Ukrainka 246/M, is more frost resistant than the original variety, and the other Ukrainka, 246/3, is more resistant to heat and drought. A selection of Ferrugineum 1239 has also been secured which is superior in drought and heat resistance, earliness and size of grain.

114. Gamaleja, N. F. 632.3:576.16:575.3
(The question of variability of microbes).
Agrobiologija (Agrobiology) 1946 : No. 3 : 115–18.

A brief summary is given of results by English and other workers in the conversion of one species of bacterium or virus into another by the use of desoxyribose nucleic acid and other agencies. These results, it is thought, afford an excellent example of the principle of vegetative hybridization propounded by Mičurin and Lysenko.

115. Gračeva, N. P. 632.3:576.16:575.3
(Controlled variation in enteric bacteria).
Agrobiologija (Agrobiology) 1946 : No. 3 : 136–42.

Bacterium coli commune (*Escherichia coli*) was cultured on a nitrogen free medium to which an extract of *B. breslau* killed by heating had been added as the sole source of nitrogen, together with healthy rabbit serum. No change in properties resulted from the first passages but in the third and succeeding passages there appeared colonies in which the capacity to decompose lactose was lost; this was first reversible but after the seventh passage there was no tendency to reversal. From the seventh onwards there appeared a capacity to be agglutinated by the *B. breslau* antiserum, in different degrees in different colonies, some of which lost the capacity to be agglutinated by the *B. coli commune* antiserum. The clinical properties of *B. breslau* were also acquired. The changes became increasingly evident after each passage and after the thirteenth the properties of the original race had been lost completely and transformed into those of *B. breslau.*

116. Tulasne, R. and
Vendrely, R. 632.3:576.312:578.65
Demonstration of bacterial nuclei with ribonuclease.
Nature, Lond. 1947 : **160** : 225–26.

Clear figures of nuclei in various species of bacteria have been obtained by removing the abundant ribonucleic acid of the cytoplasm with a 2% solution of ribonuclease at 60% C, and staining after rinsing with Giemsa solution.

117. Burkholder, P. R. and Giles, N. H. (Jun.) 632.3:581.192:537.531:575.243
632.3:581.192:535.61–31:575.243
Induced biochemical mutations in *Bacillus subtilis*.
Amer. J. Bot. 1947 : **34** : 345–48.

Mutant strains of *B. subtilis* differing from the parent strain in their inability to synthesize specific growth factors have been obtained by irradiation of spores or vegetative cells with ultra-violet or X-rays. Many of the mutant types appeared two or more times, presumably as a result of repetition of the same mutation. From 4260 isolates, 143 mutants requiring a single added substance were identified. A few mutants with multiple requirements were obtained. The relatively high yield of mutants obtained with irradiation and immediate plating of spores may indicate that the spores of *B. subtilis* are uninucleate and haploid.

118. Devi, P., Pontecorvo, G. and Higginbottom, C. 632.3:581.192:575.243:537.531
X-ray induced mutations in dried bacteria.
Nature, Lond. 1947 : **160** : 503–04.

Mutations are reported to have been induced by X-rays in *Bacterium aerogenes*, preserved in the dry state. The mutants differ from the parent strain in having new specific nutritional requirements. Some of these specific requirements have been identified. A high proportion of the mutants are of the "adaptable" type, i.e. they will not at first grow on a medium lacking the specific substance concerned, but will do so after a period of say 24 hours or more. This "adaptation" is lost on passage through a medium containing the nutrient in question. The adaptability of the mutants is attributed to (1) an inheritable change causing the production of an altered form of an enzyme, (2) an inheritable change entailing failure to produce an enzyme and opening the way for an alternative enzyme system, or (3) the inactivation of a gene which, in the normal strain, controls directly or indirectly the rate of growth of a plasmagene identical with, or precursor of, an enzyme. General methods of investigating these alternatives are indicated.

119. Lindegren, C. C. and Raut, C. 632.42:577.16:575.24:581.095
The effect of the medium on apparent vitamin-synthesizing deficiencies of micro organisms.
Ann. Mo. Bot. Gdn 1947 : **34** : 75–84.

Data have been obtained showing that different synthetic media so affect the growth of yeast that conclusions concerning specific vitamin synthesis require a more critical study of the environmental conditions than has hitherto been given in investigations on biochemical mutants.

Burkholder's conclusion that certain yeasts are "non-synthesizers" of vitamins is criticized, since the authors found that synthesis may be recorded if observations are carried out beyond the standard period of 72 hours. It was concluded that all the so-called "non-synthesizing" yeasts which remain alive when incubated in a vitamin-deficient medium will eventually grow and synthesize vitamins in that medium.

It is suggested that the ability or inability to grow in a medium may merely involve inviability in the particular medium rather than an absolute inability to synthesize the vitamin in question. Attention is drawn to an important difference between *Neurospora* and yeasts in this respect. In contrast to a filamentous fungus such as *Neurospora* which must be supplied immediately with the substances required if growth is to continue after germination of the conidium, single-celled yeast can undergo one or two divisions and then become dormant. It is suggested that the inability of the filamentous fungus to establish a dormant mycelium may give the appearance of absolute deficiencies in vitamin synthesis to many mutants of *Neurospora* which die shortly after producing filaments in vitamin-deficient media. The authors further suggest that an improvement of the vitamin-deficient medium used might lead to a higher frequency of "reversions" of *Neurospora* mutants to the wild type, i.e. "vitaminless" mutants which grow slowly in the deficient medium, such as have been described by Bonner *et al.* (cf. *Plant Breeding Abstracts*, Vol. XIV, Abst. 488).

120. Stahmann, M. A. and
Stauffer, J. F. 632.421.2:581.04:535.61–31:575.243
Induction of mutants in *Penicillium notatum* by methyl-bis (β-chloroethyl) amine.
Science 1947 : **106** : 35–36.

Morphological mutants have been induced in strain NRRL–832 of *P. notatum* by treatment with the nitrogen mustard methyl-bis (β-chloroethyl) amine, and also after irradiation with ultra-violet light.

121. Dulaney, E. L. 632.421.2:581.6
Penicillin production by the *Aspergillus nidulans* group.
Mycologia 1947 : **39** : 582–86.

Data are presented on the antibiotic activity of strains of *A. nidulans, A. quadrilineatus, A. rugulosus, A. unguis, A. variecolor* and *A. caespitosus.* The active factors appear to be penicillins or closely allied substances.

122. Beadle, G. W.,
Mitchell, H. K. and
Nye, J. F. 632.421.9:581.192
Kynurenine as an intermediate in the formation of nicotinic acid from tryptophane by *Neurospora.*
Proc. Nat. Acad. Sci. Wash. 1947 : **33** : 155–58.

Strain 65001 of *N. crassa* differs from the normal type in requiring either tryptophane, *l*-kynurenine or nicotinic acid for growth. It is suggested that these three substances are components of a chain of synthetic reactions in the normal type of *N. crassa* in the order shown. Strain 65001 differs from the normal type in a single gene.

123. Houlahan, M. B. and
Mitchell, H. K. 632.421.9:581.192:575.113.5
A suppressor in *Neurospora* and its use as evidence for allelism.
Proc. Nat. Acad. Sci. Wash. 1947 : **33** : 223–29.

A gene has been discovered in *Neurospora* sp. which suppresses the action of three different though allelic genes, each of which, in the absence of the suppressor, prevents the synthesis of pyrimidine. The inhibitory action of two other genes, which are allelomorphic neither with the three mentioned above nor with each other, and which also block pyrimidine synthesis, is unaffected by the suppressor.

124. Goes, L. A. de Almeida and
Correia, E. Margarido 632.422.3:576.16:581.6
Influência da raça da levedura (*Sacch. ellipsoideus*) como elemento a considerar na correcção da concentração hidrogeniónica dos mostos. (**Influence of the race of yeast (*S. ellipsoideus*) as an element to be considered in the correction of the hydrogen ion concentration of musts**).
An. Inst. Sup. Agron. Lisboa 1942 : **13** : 171–75.

Portuguese strains of *Saccharomyces ellipsoideus* differ in the effect that they have on the *p*H of wine musts.

125. Lindegren, C. C. and 632.422.3:577.16:575.11
Lindegren, G. 632.422.3:577.16:575.24
Mendelian inheritance of genes affecting vitamin-synthesizing ability in *Saccharomyces.*
Ann. Mo. Bot. Gdn 1947 : **34** : 95–99.

Investigations were carried out on the inheritance of the capacity to synthesize para-minobenzoic acid, pantothenate, pyridoxine and thiamin, so-called "synthesizers" and "non-synthesizers" being distinguished by the use of Burkholder's medium. An analysis was made of (1) asci from a hybrid heterozygous for the genes controlling mating type, galactose fermentation, maltose fermentation, and genes affecting the ability of the yeast to grow in Burkholder's medium without added pantothenate; and (2) asci from a hybrid heterozygous for genes controlling mating type, galactose fermentation, maltose fermentation, and genes

affecting the synthesis of paraminobenzoic acid, thiamin and pyridoxine. The results showed that the genes affecting the synthesis of all four vitamins segregated according to normal Mendelian ratios.

126. LINDEGREN, C. C. and 632.422.3:577.16:575.24
RAUT, C. 632.422.3:577.16:575.182
A direct relationship between pantothenate concentration and the time required to induce the production of pantothenate-synthesizing "mutants" in yeast.
Ann. Mo. Bot. Gdn 1947 : **34** : 85–93.

"Non-synthesizing" cultures of yeast are described which synthesize pantothenate when the concentration of pantothenate in the medium falls below the minimum required for growth. The rate of growth is independent of the concentration of pantothenate below the amount of 2 γ per litre, but the time at which the "mutation" is induced, or the delay in growth, depends upon the concentration of pantothenate. It appears that some pantothenate, either in the cell or medium, must be present before synthesis can be initiated; it is suggested that the cells in the medium to which no pantothenate was added did not necessarily begin growth in the absence of pantothenate, since each cell probably contained a sufficient amount for the initiation of growth.
The authors suggest that pantothenate is an agent which brings a temporarily inactive gene into functional activity, and that the "mutation" or restoration of synthesizing ability to a "non-synthesizer" may be the result of the addition to the gene of one of its components. It is thought that the gene component involved might correspond to a cytogene.

127. WOODS, M. W.,
WOODS, A. F. and
DUBUY, H. G. 632.8:581.174:575.2:633.71
Comparative action of viruses and mutant chondriogenes on plant cells.
Phytopathology 1947 : **37** : p. 442. (Abst.).

Mutant chondriogenes affect cells in three ways: (1) they produce qualitative changes in the structure and function of the plastids possessing them; (2) cause quantitative changes in the development of non-mutated plastids of the same cell; and (3) alter the function and development of the cell as a whole. At least five different types of mutant plastids have been observed in a single species. It is reported that infection of *Nicotiana Tabacum* L. with strains of tobacco mosaic virus results ultimately in cytological changes parallel to those brought about by mutant chondriogenes.

128. BAWDEN, F. C. and
ROBERTS, F. M. 632.8–1.521.6:578.08
The influence of light intensity on the susceptibility of plants to certain viruses.
Ann. Appl. Biol. 1947 : **34** : 286–96.

Experiments are reported which indicate the importance of conditions of controlled illumination in raising plants for investigations on viruses, since differences in light intensity cause variations in susceptibility.

129. SLOGTEREN, E. VAN 632.8:633:578.08
Serologische diagnostiek van virusziekten van land- en tuinbouwgewassen. (**Serological diagnosis of virus diseases of agricultural and horticultural crops**).
Landbouwk. Tijdschr. Wageningen 1946 : **58** : 546–55.

The biochemical basis, technique and applications of serological diagrams of virus diseases of crops are discussed.

130. FRANSEN, J. J. 632.951.1:581.192
Pyrethrum. (***Pyrethrum***).
Tijdschr. Ned. Heidemaatsch. 1940 : **52** : 2–20.

The species of *Pyrethrum* of value as sources of insect powder and the countries in which they are found are mentioned.

The active principles of the powder and the chemical determination of its insecticidal properties are discussed.
Bibliographical references are given throughout.

ECONOMIC PLANTS 633

131. HODGE, W. H. 633(85)
The plant resources of Peru.
Econ. Bot. 1947 : **1** : 119–36.
An account is given of the wide range of economic plants grown in Peru.

132. BOEUF, M. F. 633:35(82)
L'organisation de la production et du commerce des grains en Argentine. **(The organization of crop production and commerce in Argentina).**
Ann. Inst. Nat. Agron., Paris 1942 : **33** : 74–101.
An account is included of the organization of production, testing and recording of varieties and the control of the use of seeds.

133. PAL, B. P. 633:575.125(54)
Studies in hybrid vigour. 1. Notes on the manifestation of hybrid vigour in gram, sesamum, chilli and maize.
Indian J. Genet. Pl. Breed. 1945 : **5** : 106–21.
Studies of hybrid vigour in gram (*Cicer arietinum*), sesame (*Sesamum orientale*), chilli (*Capsicum annuum*) and maize were carried out at the Imperial Agricultural Research Institute, New Delhi, with a view to making the choice of a suitable plant for intensive investigations on hybrid vigour.
Number of pods per plant was the only character which showed marked hybrid vigour in the gram.
Very few of the F_1 intervarietal hybrids of sesame exhibited conspicuous hybrid vigour. The characters studied included: plant height, number of leaves per plant, number of branches per plant, number of days from sowing to maturity, number of capsules per plant, and yield per plant.
Some of the F_1 hybrids of chilli strains showed slight heterosis in weight of dry fruits per plant, time of flowering, or plant height.
As found by numerous previous investigators, crosses between inbred lines of maize showed very pronounced hybrid vigour. Maize therefore appears to be the most suitable plant for further investigations at the Institute on the nature of hybrid vigour.

134. NAESVOLD, V. 633:577.16(48.1)
Undersøkelser av C-vitamin-innholdet i nordnorsk plantemateriale. **(Investigations of vitamin C content in plants in Northern Norway).**
Meld. Stat. Forsøks. Holt 1939 (1940) : H52–H58.
Meld. Stat. Forsøksstasjoner Plantekult 1939 (1941).
Extensive lists are given of the vitamin C content of wild and cultivated plants in northern Norway.

135. VASCONCELOS SOBRINHO, J. DE 633:581.02:537.59
Os raios cósmicos e sua influência sôbre a vida vegetal. **(Cosmic rays and their influence on plant life).**
Arquiv. Inst. Pesquisas Agron. Pernambuco Brasil 1946 : **4** : 81–89.
The Rosicrucian hypothesis is expounded that everything in the universe emits vibrations. Cosmic rays, the terrestrial rays of von Pohl, and the psychic vibrations of Attil and Cazzamalli are cited as examples of this universal characteristic. It is believed that at certain "dead spots" on the earth's surface these vibrations cross and set up a state of discordance, which, among its various effects, renders plant life difficult. Several areas in Brazil where certain plants have proved unable to develop for no apparent reason are quoted as examples of "dead spots".

136. Goodall, D. W. and Gregory, F. G. 633:581.192
Chemical composition of plants as an index of their nutritional status.
Tech. Commun. Imp. Bur. Hort. Plantat. Crops 1947 : No. 17 : Pp. 167.
Varietal differences in chemical composition, fertilizer response and deficiency symptoms are briefly discussed with reference to methods of plant analysis and deficiency diagnosis. Numerous references are made to papers on varietal differences.

137. Schnarf, K. 633:581.3
Die Befruchtung bei den Angiospermen. (**Fertilization in the angiosperms**).
Biologe 1941 : **10** : 258–64.
An elementary account is given of fertilization and the development of the embryo in the angiosperms.

138. Fanshawe, D. B. 633:582:001.4(88)
Arawak Indian plant names.
Caribbean Forester, Puerto Rico 1947 : **8** : 165–81.
Arawak plant names used in British Guiana and their botanical equivalents are listed.

139. 633–1.521.5(42)
Horne, F. R. 633.00.14(42)
The work of the National Institute of Agricultural Botany.
Agric. Progr. 1946 : **21** : 77–87.
A concise account is given of the various activities of the National Institute of Agricultural Botany, Cambridge.

140. Briquet Junior, R. 633–1.524:35(81)
Introdução e aclimatação de plantas. (**Introduction and acclimatization of plants**).
Ceres, Brasil 1942 : **4** : 74–83.
Suggestions are made for establishing an organization in Brazil for dealing with plant introduction.

141. 633–1.531.12:575(49.3)
Programme-guide des expériences et recherches de plein champ et détails des travaux de multiplication des semences. (**Programme-guide of field experiments and investigations and details of the work of multiplying seeds**).
Sta. Rech. Etat Amélior. Plantes, Gembloux 1945–1946 : Pp. 80.
Schemes for improving barley, wheat, oats, flax, horse beans and tobacco are described.

142. Johnson, J. 633–2.4–1.521.6:581.032
Water-congestion and fungus parasitism.
Phytopathology 1947 : **37** : 403–17.
Experiments were carried out on water congestion in the intercellular spaces of the tissues of several crop species and varieties, and on the relation between water congestion and fungus infection. The following diseases were investigated: bean anthracnose, potato late blight, tomato late blight, barley leaf blotch, leaf rust of oats, wheat stem rust, maize rust and sunflower rust. Visible water congestion developed in as little as one hour in some species, while in others, e.g. the potato and sunflower, visible water congestion was not obtained in the experimental moist chamber. Marked differences in the rate and amount of water congestion occurred between varieties of the same species, and sometimes between plants of a single variety. Water congested plants of the same variety were more predisposed to fungus infection than plants not water congested. In general, varieties susceptible to disease congested more readily than resistant varieties. The significance of water congestion in the behaviour of plant diseases is discussed.

143. ROBERTSON, J. G. 633.1:575(71)
Recent agricultural developments in Canada.
J. R. Soc. Arts 1947 : **95** : 657–73.
An account is included of the wheat, oats, and barley varieties bred in Canada.

144. 633.1:575(94.5)
633.52:575(94.5)
State Research Farm, Werribee. Experimental work and results.
J. Dep. Agric. Vict. 1947 : **45** : 337–53, 377–87, 392.
The article includes a detailed account of the wheat, oats and barley breeding work carried out at the State Research Farm, Werribee, Victoria. The following important wheat varieties have been developed at Werribee: Quadrat, Ghurka, Pindar, Pinnacle, Magnet, Ranee and Regalia. The new Diadem wheat was selected at Longerenong from a cross between Ghurka and White Fife, made at Werribee (cf. Abst. 160); and the new Insignia variety was produced at the Mallee Research Station, Walpeup, from a cross between Ranee and Ghurka, which also originated at Werribee (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 1497).
The oats varieties developed at Werribee include Algeribee, Palestine and Dawn. The Research barley variety, distributed to growers in 1942, was bred at Werribee from a cross between Prior and Plumage Archer.
Investigations at the State Research Farm also include breeding of fibre types of flax; this breeding programme was undertaken during the war. Yielding ability, fibre content and quality, the early winter growth habit, and resistance to rust and wilt are receiving attention under the scheme. Disease resistance has been introduced from linseed types, obtained from America and the U.S.S.R.

145. 633.1:575:007(47)
Order of Lenin for veteran Soviet selectionist.
Soviet News 1947 : No. 1780 : p. 2.
It is reported that N. Rudnickiĭ has been awarded the Order of Lenin for his plant breeding and selection work and upon the occasion of his seventieth birthday. Varieties of rye, barley and oats developed under the direction of Rudnickiĭ occupy at the present time an area of 20 million acres in the Soviet Union. Rudnickiĭ was recently awarded a Stalin prize (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1524).

146. 633.1:581.14(49.2)
WOUDENBERG, J. P. M. 635.656:581.14(49.2)
Phaenologische waarnemingen aan landbouwgewassen in 1934–1936.
(Phenological observations of agricultural crops in 1934-36).
Landbouwk. Tijdschr. Wageningen 1946 : **58** : 272–80.
This paper fills a gap in the series of phenological observations which Koeslag began to collect for the main crop plants of Holland before his death in 1934. Records for subsequent years have been published regularly. The crops concerned here are: winter and spring wheat, winter rye, oats, spring barley, and peas.

147. 633.1–1.524(47)
FRENKELJ, A. I. 633.1:582(47)
(Plant resources of the Tuva republic and their economic significance).
Jarovizacija i Selekcija (Vernalization and Plant Breeding) 1937 : 146–84.
Soft wheats of *Triticum vulgare* Host. are predominant in the republic. An expedition by the Lenin Academy of Agricultural Science discovered among them in 1934 the variety *fuliginosum* Al., and a new variety, *araticum* Frenk. Eight new botanical varieties of the *inflatum* type were identified. A group of wheats termed *Sphaeroidea* Frenk. were found to have certain resemblances to *T. sphaerococcum* Pers.
During the interval between ear emergence and ripeness, cold weather is likely to begin prematurely, and the period of daylight is somewhat short. The plant breeder is therefore called upon to find varieties which can withstand the cold and ripen quickly. Among those which may satisfy these requirements are Sarrubra, Tulun ZA/32, and Lutescens 062, E–223, and E–478. The expedition also studied four botanical varieties of barley, several

varieties of millet, belonging to four groups *effusum*, *patentissimum*, *contractum*, and *compactum*, and five botanical varieties of oats. Most of the latter were from Siberia but some resembled the Mongolian type. I. Z.

148. KOKOLIOS, B. 633.1–1.531.12(49.5)
(**The seed production of cereals in Greece 1930-1945**).
Bull. Minist. Agric. Inst. Pl. Breed. Thessaloniki 1947 : No. 32 : Pp. 31.

An account is given of the work of the seed production service in Greece since its creation in 1930. All the approved cereal varieties have been increased and they now cover 50% of the area cultivated with cereals.

149. BUSTARRET, J.,
JONARD, P. and 633.1–2.111–1.521.6(44)
MAYER, R. 633.853.49–2.111–1.521.6(44)
Observations sur les effets de l'hiver 1946–47 sur les céréals et oléagineux d'automne. (**Observations on the effects of the winter 1946-47 on autumn cereals and oil yielding plants**).
C.R. Acad. Agric. Fr. 1947 : **33** : 314–20.

The resistance to cold of different wheat, oat, barley, colza and turnip-rape varieties as shown by the effect on them of the winter of 1946–47 is compared, and observations are made about the future breeding of cold resistant types.

150. 633.1–2.111–1.521.6(48.5)
EKSTRAND, H. 633.14–2.111–1.521.6(48.5)
Höstsäden och vinterhärdighetsproblemet. (**Autumn cereals and the winter hardiness problem**).
Växtskyddsnotiser, Stockholm 1946 : Nos 1–2 : 15–21.

EKSTRAND, H.
Förekomsten av utvintringssvampar på höstsäd och vallväxter i Finland. (**The occurrence of fungi causing winter-killing on autumn cereals and herbage plants in Finland**).
Ibid. 1946 : No. 4 : 49–55.

Some results are given from investigations still in progress on the overwintering of autumn cereals and herbage plants and on varietal resistance to the different parasitic diseases of the winter season.
It is of great importance, especially in breeding operations, to distinguish between cold hardiness and winter hardiness and to realize that it is often not defective cold resistance, but the lack of resistance to fungi such as *Typhula*, *Sclerotinia*, or *Fusarium* or seasonal conditions favouring such fungi, that limit the range of cultivation of autumn cereals in northerly parts of Sweden. Cold is, however, a highly important factor affecting overwintering of cereals in southern Sweden. Breeding for resistance to the fungi concerned offers a way of extending the range for cereal crops northwards.
Similar factors are shown to affect the range of rye growing in northern Sweden.
Varietal differences in resistance to fungous diseases and the problem of physiological races of various pathogens which may cause winter injury are also mentioned.
In the second paper an account is given of a tour in Finland which provided an opportunity of observing (1) varietal reactions of wheat and of ryes in different localities to attack by various fungi; and (2) the influence of soil conditions and manures on resistance to fungi causing winter injury.
The views expressed in the first paper were borne out by conditions in Finland and confirmed by M. Salminen, director of the Plant Cultivation Station at Maaninka.

151. KNUTSSON, G. 633.1–2.111–1.521.6(48.5)
Höstsädens Övervintring. Några erfarenheter från försöken i Uppsala län. (**Over-wintering of the autumn cereals. Some results from experiments in the Uppsala district**).
Lantmannen 1947 : **31** : 488–89.

Figures are cited showing the over-wintering capacity of varieties of wheat, rye and barley in different parts of the Uppsala district. The wheats included Ergo, Thule III, Eroica, Sv.

01392 and Sv. 01420; the ryes Kungs II [King's II] and Stål [Steel]; and the barleys Fimbul and Bore. Winter barleys overwintered well in many cases where snow cover was good, but the question of the northern geographical limit for this crop is still unsolved.

152. LEBLOND, D. 633.1–2.4–1.521.6(71)
Les maladies des céréales dans Québec et le degré de susceptibilité de certaines variétés à ces maladies (1939–42). [**The diseases of cereals in Quebec and the degree of susceptibility of certain varieties to these diseases (1939–42)**].
Ann. Ass. Canad. Fr. Advanc. Sci. Montréal **1943** : **9** : p. **135**.

The oat varieties Lasalle, Roxton and Vanguard are stated to be the most resistant to stem rust, Erban, Lanark, Roxton and Vanguard to leaf rust, Forster and Lanark to leaf stripe, and Banière, Erban and Mabel to leaf spot.

153. SALTROE, THV. and
TEIGLAND, J. 633.1.00.14(48.1)
Forsøk med vårkornsorter 1935–1939. (**Trials with spring cereals 1935–39**).
Meld. Stat. Forsøksstasjon Kjevik **1940** (**1941**) : H62–H85.
Meld. Stat. Forsøksstasjoner Plantekult **1940** (**1942**).

Particulars are given in the text and extensive tables of trials conducted at Kjevik Experimental Station (Norway) with well known Swedish, Canadian and other wheats, including the Norwegian varieties, Ås, Mo 07 (a selection made by Vik from Montana), Fram I and II, Budde, Frøya, and the selection E425 from Voll Experimental Station. Two American wheats were also tested, Sibirisk No. I and Marchosser, both from Alaska Agricultural Experiment Station.
Similar information is given on barley trials which comprised the two Norwegian varieties Maskin and Stjerne [Star] with Swedish and Danish barleys.
Oat trials were conducted with Swedish varieties and some Norwegian selections, e.g. Merkur (Forus), and the Danish oat, Solv II [Silver II].

154. BALAŠEV, L. L. and
GODUNOVA, K. N. 633.1.00.14:631.8(47)
(**The cultivation of varieties**).
Selekcija i Semenovodstvo (Breeding and Seed Growing) **1946** : **13** : No. **6** : **3–17**.

Trials carried out to compare the effects of different levels of manuring, date of sowing and rate of sowing on different cereal varieties are discussed.

WHEAT 633.11

155. CILLIS, U. DE 633.11(45.8)
I frumenti siciliani. (**The Sicilian wheats**).
Publ. Staz. Sper. Granicolt. Sicilia **1942** : No. **9** : Pp. **323**.

This account of wheat growing in Sicily reviews all the varieties grown which are analysed and classified according to a uniform scheme specially worked out for the purpose. Information is given on botanical, morphological, biological and agricultural characteristics of the locally grown varieties, the yields, and the milling and baking qualities. The main varieties are shown in photographs [scale $\frac{2}{3}$ of natural size for the ear and double natural size for the grain].
Any hybridization programme for the improvement of yields and crops should be based on the locally grown varieties which, in a long period of cultivation and through natural selection have adapted themselves to their surroundings, which in Sicily differ widely from one region to the other.
Up to some 10 years ago the Sicilian peasant was in the habit of selecting his seed corn directly in the field. This practice is called "ammannato". The system has been given up since, as it has proved too expensive, and also because, in the meantime, the varieties have become much purer and genetically more stable. The more developed a district is, the purer and more uniform are the varieties grown. Only in backward districts does one find a mixture of several varieties on the same field. E. M. F.

156. Kovalevskiĭ, L. I. 633.11:575(47)
(Breeding and seed production of spring wheats at the Nemerca Breeding Station).
Selekcija i Semenovodstvo (Breeding and Seed Growing) **1946 : 13 :** No. 6 : 45–46.
Selections have been made from ancient local races such as Arnautka and Sinekoloska. A form of Arnautka has been produced which is resistant to fungal attack, to frit fly and to Hessian fly and reacts well to vernalization. It also yields well, and, though it is a form of *Triticum durum*, is said to be of good baking quality.
Brief data are given of certain other promising selections, some of *T. durum* and some of *T. vulgare*.

157. Sekun, P. F. 633.11:575(47)
(New varieties of winter wheat in the Moscow Province).
Selekcija i Semenovodstvo (Breeding and Seed Growing) **1946 : 13 :** No. 6 : 31–34.
Wheat breeding in the Moscow province has been based on the extensive collection of local forms made in 1933 in the whole of the Moscow province and adjacent areas. New varieties produced include MOS–1 and MOS–2, which are resistant to bunt attack, and MOS–4, which has excelled the standard in baking quality and in winter hardiness, in which latter respect it is almost equal to winter rye. These three varieties gave an average yield over the seven year period 1938–44 which was 3–4 c. per ha. greater than that of the standard, and MOS–4 was specially good in the severe winter of 1939.
The pedigrees of the three varieties are given, with descriptions of their main characteristics. The two first are hybrids of Moscow 3251 x Moscow Squarehead 42, while MOS–4 is a selection from a local wheat of the Ivanov province.

158. Lathbury, R. J. 633.11:575(67.62)
The development of wheat varieties in Kenya.
Emp. J. Exp. Agric. **1947 : 15 :** 177–88.
An account is presented of early wheat breeding in Kenya, the baking quality of Kenya wheats, physiological races of stem rust, breeding for stem rust resistance, the production of new hybrids since 1921, and introduced varieties.

159. Maneiro, R. V. 633.11:575(82)
La acción oficial y privada en el mejoramiento de la producción triguera del pais. (**Official and private action in improving the wheat production of our country**).
"Granos" Semilla Selecta, B. Aires **1946 : 10 :** Nos 7, 8 and 9 : 31–32.
A short description is given of the various state and private research institutions that have engaged in wheat breeding in Argentina.

160. 633.11:575(94.5)
633.13:575(94.5)
New cereal varieties.
J. Dep. Agric. Vict. **1947 : 45 :** p. 166.
The release of the new Diadem wheat and Orient oat varieties is reported. Diadem was developed from a cross between White Fife and Ghurka. In yield trials extending over six years at Longerenong College, it has consistently outyielded Ghurka and Quadrat. Diadem is mid-season to late in maturity. It possesses a white-chaffed tip-awned, fairly compact square head which threshes readily. It is a medium strong wheat, producing flour markedly superior to that of Ghurka and Quadrat.
Orient was selected from a cross between Palestine and Dawn. It is an early maturing, short-strawed variety, suitable for winter sheep-grazing and capable of producing a good yield of well-filled grain after recovery. It is considered that Orient will be a useful variety in the Mallee region of Victoria. In tests during the past 11 years at the Mallee Research Station, Orient has given higher yields, on both stubble ground and when winter grazed, than Algerian and other varieties.

161. PETROV, I. P. 633.11:575:581.056(47)
(New varieties of winter wheat).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : No. 6 : 43–44.

Several new spring wheats produced by the Siberian Institute of Grain Husbandry combine resistance to drought, fungous diseases and lodging with increased yielding capacity. One of them, Caesium 94/14530, is equal, and often superior, in baking quality to the previously accepted standard in this respect, Caesium III.

A number of early maturing varieties have been selected; the best of these are Milturum 2078 and Milturum P–146; the former ripens two weeks before Milturum 321, though it is somewhat lower in yield, whilst P–146 is equal to Milturum 321 in yield and ripens 8–10 days earlier, is free from lodging and has grain of very high quality.

162. CHEVRETTE, J. E. 633.11:575"793"
Hérédité de la précocité et d'autres caractères dans le blé de printemps.
(Inheritance of earliness and other characters in spring wheat).
Ann. Ass. Canad. Fr. Advanc. Sci. Montréal 1942 : **8** : p. 120.

A study of the genetics of the progeny of four crosses between the varieties Prelude, Garnet, Canus, Stanley and Huron, showed that the inheritance of earliness is due to multiple factors having a cumulative effect. In one of the crosses the presence of awns was controlled by a single gene, and in another, by two homologous genes. Pubescence and colour of the glumes proved to be simple Mendelian characters, each due to a single factor. The results also showed that the factors for earliness and awns tended to be transmitted together, while the other factors were inherited independently.

163. GLAERUM, O. 633.11:575"793"(48.1)
Sortsforsøk med høsthvete og foredling av høsthvete. **(Variety trials with autumn wheat and breeding of autumn wheat).**
Meld. Stat. Forsøks. Møistad 1939 (1940) : H3–H13.
Meld. Stat. Forsøksstasjoner Plantekult. 1939 (1941).

Good over-wintering capacity combined with stiff straw suitable for machine harvesting, a satisfactory quality of grain and an average yield of about 300 kg. per dekar, are essential in wheats for cultivation in the Uppland counties of Norway. The trials under review lasted from 1920 to 1939: they included varieties and numbered selections among which only a new variety Heid of obscure origin was regarded as meeting the above requirements, except for a rather weak straw which, however, did not prevent machine harvesting in most years. It is fairly early ripening, and the baking strength according to official Government laboratory tests was good, with a gluten which needs, and will stand only a small addition of improving flours.

Heid was the name given by the author to the wheat raised in Norway from one of a number of samples received from A. Hønningstad: it was marked "Stavropolsk No. 193—Russia", but its history could not be traced. It is being multiplied up and should be on the market in a few years for the farmers in the Uppland counties.

Hybrid progeny from a cross between Heid and another numbered wheat exhibit Heid's reliability as a winter wheat and a much stiffer straw derived from the other parent. This new wheat must, however, be tested further for its reliability, yield and quality.

164. ILJENKO, G. T. 633.11:575.127.2(47)
(The first stage of work with hybrids of *Triticum vulgare* x *T. dicoccum* in Nagornyi Karabah).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : Nos 7–8 : 29–33.

Emmer wheat (*Triticum dicoccum*) is popular in Azerbaijan, being used for making grits. When sown in spring it exceeded all soft wheat varieties in grain yield and in winter sowings its yield was equal to most winter varieties. It was crossed with a form of *T. turgidum* found in the local wheat fields and with *T. durum* var. *affine*. Good seed sets were obtained and the hybrids produced combined characters from both parental species, except that they were much more rust resistant.

In 1942 crosses were made with a number of varieties of *T. vulgare* and two different varieties of *T. durum*. A certain number of grains were set in each of the combinations though the set with *T. vulgare* was much less than with *T. durum*. The hybrids produced again displayed certain characteristics from each of the parental species.
All series showed great variation in the F_2 and F_3 generation; plant height for example varied from 50 to 200 cm., thousand corn weight from under 20 to 60 grm., and rust resistance from no attack to almost complete infection. All possible ear sizes and types appeared.
Hybrids of emmer with certain wheat varieties on the other hand were almost constant and hardly distinguishable from the cultivated variety; for instance the hybrid with Horanka resembled Horanka in almost everything but was rust resistant and capable of withstanding more extreme conditions than was Horanka.
Many of the hybrids had grain which separated from the chaff but all without exception had brittle rachis.

165. Dolgušin, D. A. 633.11:575.127.5:633.14:581.162.5:575.3
(Some peculiarities of the fertilization process in plants).
Agrobiologija (Agrobiology) **1946** : No. **3** : 51–58.

Emasculated florets of the winter wheat **1160** were pollinated with rye pollen at seven different phases of development, from the stage before the ovary had bifurcated to the stage when the stamens ripened. A certain number of controls were pollinated with wheat pollen at each stage. In all experiments the maximum seed set was obtained from pollinations effected 1–3 days before the stamens would have matured. In pollinations effected in the earlier stages of development however the set obtained from rye pollen was nearly the same as that from wheat and the differences became increasingly marked as the age of the egg cells increased.
A further experiment consisted of emasculating a number of ears of Diamant spring wheat on 11 July, bagging them and pollinating some at each developmental stage with pollen from Kirov Vjatka rye and with spring wheat No. 59 as controls. Again at the first stage the set from rye pollen and wheat pollen was approximately the same, being 8·3% and 8·1% respectively; at stamen maturity however no set at all was obtained from rye pollen, though pollen of Diamant wheat still produced seed.
The seed obtained from rye pollen applied at the earliest stage of all to wheat 1160 was small and shrunken and often had no embryo; that from the later pollination was larger and germinated. From Diamant wheat the seed from all pollinations was well formed and contained embryos, though seeds from the earliest stage of all were very small.
From these experiments it is concluded that in annual plants, just as Mičurin found in fruit trees, the special characteristics of a species or variety are less pronounced in the early developmental stages and that by operating in these stages it is possible to effect combinations which at more advanced phases would be incompatible.

166. Ragulin, A. A. 633.11:575.127.5:633.289
(Intergeneric hybrid of wheat and *Elymus*).
Selekcija i Semenovodstvo (Breeding and Seed Growing) **1946** : **13** : Nos **4–5** : 39–42.

Over 30 of the 45 species of *Elymus* occur in the U.S.S.R. and are put to the most varied uses; some of the large grained forms are even used for bread. The flour from *E. arenarius* L. contains up to 24·3% dry gluten. They are very much less exacting as regards soil and climate conditions than cultivated wheats and also give much higher yields of grain. Attempts to cross *Elymus* spp. with cultivated cereals were started in 1937 under the direction of I. V. Cicin. Pollinations were made of *E. giganteus* and *E. arenarius* with a number of different wheat varieties and certain *Triticum* x *Agropyron* hybrids. No hybrids were obtained from *E. giganteus* but the cross Palestinka (*T. durum*) x *E. arenarius* gave a set of 11·6%. Seeds were set also in the crosses *E. arenarius* with *T. Timopheevi* and with the 42 chromosome wheats. The grains from the 28 chromosome group were larger, those from Palestinka for example varying from 5 to 7 mm. in length and 2 to 2·5 mm. in breadth. All the seeds set in the first year's experiment failed to germinate and the following year 1355 pollinations of Palestinka x *E. arenarius* were made, and 1159 of Palestinka x *E. giganteus*. Again the latter combinations gave no set, the former gave a

set of 12.2%. This year the embryos of the hybrid grains were germinated in artificial media and then transferred to pots of soil and vigorous seedlings with several dozen stems were obtained. They were multiplied vegetatively by dividing the plants on 4 May and 15 May and in this way up to 36 plants from each seedling were produced.
The *Elymus* characters predominated in the seedlings, the leaves were glaucous and larger than wheat leaves; the ears were of mixed type, bearing the spikelets singly in the upper portion and in pairs in the lower portion. Earing began on 28 June. The empty and flowering glumes were longer than in the parents, intermediate in breadth. The length of the main ear was 16 cm. and it bore 54 spikelets, i.e. the values were intermediate between the two parents.
The hybrid contained 42 somatic chromosomes and is thus intermediate between the two parents Palestinka ($2n = 28$) and *E. arenarius* ($2n = 56$).
The hybrids were sterile, having imperfectly developed anthers, and attempts are now being made to overcome this sterility.

167. Maljuta, D. I. and Kuljčickaja, Z. A. 633.11:575.127.5:633.289(47)
(Wide hybridization in breeding work).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : Nos 7–8 : 25–28.

Some 1483 different *Triticum* x *Agropyron* hybrids, representing F_2 to F_{10} generations, some fixed and some segregating, but all spring forms, were examined at the Krasnyĭ Kut experiment station, using the standard local variety Erythrospermum 841 as control. One of the hybrids, No. 52959/36, gave a four-year average yield 35% in excess of that of the control, and this and several other hybrids outyielded the control in both dry and wet years. The grains of the hybrids were smaller and more floury than those of the standard variety; No. 53524/36 had the best grain, and No. 53324/36 the best combination of yield and grain size. The hybrids were less attacked by frit fly and Hessian fly and even when attacked, the plants were not entirely killed but quickly formed strong secondary shoots. Most of the hybrids were badly attacked by loose smut but No. 53524/36 suffered less than the standard, itself a relatively resistant variety, No. 5099 also proved highly resistant and yielded 6% more than the standard. The hybrids suffered less from brown rust and lodging.
The hybrids were subjected to further selection and in 1944 23·6% of the selections yielded more than the standard and had fairly large grain, with a thousand corn weight of not less than 30 grm. The best hybrids were crossed in 1944 with Erythrospermum 841, in the hope of improving their grain.
A number of winter forms were also studied; these are less cultivated in type, but some of them, e.g. Lutescens 329 x *A. elongatum*, are extremely winter hardy and are being used in crossing. In the F_1 [Lutescens 329 x (Lutescens 329 x *A. elongatum*)] x Hostianum 237, different characters were dominant in different years; the hybrids were for instance sometimes pubescent and sometimes glabrous. A wide range of types segregated in the F_2; many of them were characterized by open flowering, which permits of mass hybridization.

168. Tsitsin [Cicin], N. 633.11:575.127.5:633.289(47)
Perennial wheats.
Discovery 1946 : **7** : p. 180.

A brief report is given of achievements in the Soviet Union in the work of crossing wheat with *Agropyron*, rye, and *Elymus*. Mention is made of new varieties of perennial wheat which have now been developed from crosses between wheat and *Agropyron*, and which are recommended for sowing on a large scale. It is also reported that hybrids of wheat and barley with *Elymus* have recently been secured. As a result of these crosses, it is considered that the production of varieties bearing 200–300 grains per ear will be possible.

169. Wellensiek, S. J. 633.11:575.129:633.14:581.04(49.2)
Methods for producing *Triticales*.
J. Hered. 1947 : **38** : 167–73.

Experiments on the production of *Triticale* amphidiploids ($2n = 56$), conducted at the Instituut voor Plantenveredeling (Plant Breeding Institute), Wageningen, Netherlands,

are described. F_1 plants of winter wheat x winter rye were vegetatively reproduced by dividing the plants before shooting. The F_1 seed is spring sown, since under Dutch conditions plants sown in late April or early May will remain in the vegetative stage until the following spring. By successive division of these plants clones of at least 300-400 plants were secured in one season.

The clonal plants were then subjected to colchicine treatment. The plants were dug up and placed with their roots in an aqueous solution of colchicine; the most promising results were obtained using 0·05% solution intermittently during a period of four days, the roots of the plants being placed in the colchicine solution during the day and during the night in water. A good proportion of treated F_1 clonal plants from crosses between Juliana, Carsten V and Lovink winter wheats on the one hand and Petkus winter rye on the other exhibited partial fertility. Some F_2 kernels from this material were saved when evacuation of Wageningen was necessary in 1944. Finally, 81 F_2 plants were harvested at Enkhuizen. In addition to this material, 14 F_2 plants of the cross Juliana wheat x Petkus rye derived from F_1 plants treated according to Van Dillewijn's method were also saved. This method consists of introducing 0·1 aqueous colchicine solution with a syringe into the decapitated coleoptile after having removed the primary leaf (*Plant Breeding Abstracts*, Vol. XVII, Abst. 222). The F_2 plants investigated have been found to possess 56 or approximately 56 somatic chromosomes. Some of the F_3 progenies showed an unexpected variation in the F_4, both in morphology and degree of fertility. Satisfactory uniform strains have not yet been produced, but it is expected that by selection such strains will be secured.

These results justify the initiation of a breeding programme to develop ecomomically valuable *Triticale* varieties. The aim of such a programme is to produce a crop with wheat-like quality which can be grown on poor rye soils, and which will equal or exceed rye yield. This is to be attempted by selection, or failing selection, by crossing *Triticale* lines and further selection. The author suggests that use should be made of the genes for crossability between wheat and rye reported by Lein (*Plant Breeding Abstracts*, Vol. XIV, Absts 831 and 1197). It is also suggested that since rye is a cross-fertilized species and the *Triticale* amphidiploid resembles wheat in being self-fertilized, inbred varieties of rye should be used that are resistant to loss of vigour; in this way the rye component in *Triticale* will not suffer from the effects of inbreeding which might lead to a loss in vigour. Such inbred lines of rye are available.

170. Kornilov, A. A. **633.11:575.3:581.143.26.035.1:575.115**
(Controlling dominance of characters in wheat breeding).
Doklady Vsesojuz. Akad. Seljsk. Nauk im. V. I. Lenina (Proc. Lenin Acad. Agric. Sci. U.S.S.R.) **1947** : No. **1** : **22–23.**

Treatment with short day of 10-11 hours from the time of appearance of the second true leaf was applied to a number of wheat hybrids. Their ears emerged between 12 and 25 May, whereas those in the controls emerged between 24 and 29 April, according to the hybrid. Treatment of F_2 populations had a marked effect upon the dominance of various characters. Hybrids of Ak-Bidaï 0630 x Dicoccum x Melanopus 069 grown in long day had lax ears, enclosed grain, and all belonged to the *Triticum durum* varieties *factuosum* and *africanum*. In short day only 58% belonged to these two varieties and 30% to *affine*, 8% to *melanopus* and 4% to *leucurum*; 67% threshed easily and only 33% had enclosed grains, and segregation occurred for ear pubescence and grain colour too. The yields of grain were higher in the plants treated with short days.

171. **633.11:581.03**
Perrault, C. **633.16:581.03**
Influence de l'eau chaude sur le pouvoir germinatif de certaines variétés de blés et d'orges. **(Influence of hot water on the germinating capacity of certain varieties of wheat and barley).**
Ann. Ass. Canad. Fr. Advanc. Sci. Montréal **1937** : **3** : p. 99.

It is reported that treatment of seeds with hot water in order to kill rusts has different effects on different varieties of wheat and oats, showing that the permeability of the seeds and the sensitivity of the embryos vary according to the varieties.

172. VINOGRADOVA, E. I. 633.11:581.162.32:578.08
(The application of the method of group pollination in wheat).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : Nos 4–5 : p. 70.

The method recommended for making artificial crosses is to emasculate a number of ears of the seed parent and bag them. Ears of the pollen parent just reaching the stage of anthesis are kept in water overnight and introduced into the bag with the emasculated ears the next day, their stalks being kept in a flask of water.
Good seed sets have been obtained by this method and one of the advantages claimed for it is that many of the families obtained by it show no segregation in the F_2 generation.

173. BJÖRLING, K. 633.11:581.175.11:575.12(48.5)
Melanism hos olika vetesorter. **(Melanism in different varieties of wheat).**
Växtskyddsnotiser 1946 : No. 6 : 85–91.

The various symptoms and different possible causes of this condition affecting the stem and glumes are discussed.
Observations from 1942 to 1946 at Åkarp have suggested that the Swedish autumn wheats Äring II and III and the spring wheat Atle were much more prone to the brown spotting on the upper portion of the stem and on the chaff than other wheats in general cultivation. Similar evidence was afforded by experimental breeding material comprising plants from crosses with the above three varieties in their ancestry.
Swedish wheats also showed varietal differences in regard to their tendency to typical "internodal melanism" affecting the lower parts of the stem, but their varietal nature is not so marked as for the other type of melanism.

174. HARRIS, R. H. and
SIBBITT, L. D. 633.11:581.6
Comparative effects of absorption and temperature on mixogram patterns of different wheat varieties.
Baker's Digest 1945 : **19** : 17–21, 27.

The results are reported of an investigation of the effects of variations in mixing absorption and temperature on the mixogram patterns of the flour of different wheats with particular reference to dough development rate. The effects of these variations on gluten dispersion in the dough and on dough temperature rise during mixing were also examined. The flours used were from the varieties Vesta, Thatcher, Mida, Tenmarq, Early Blackhull and a variety of *Triticum durum*. Distinct varietal differences were found in curve properties, especially in dough development at the higher absorptions and temperatures. Gluten dispersion in the dough also varied according to the variety.

175. SOPRANIS Y PEÑASCO, F. S. DE 633.11:581.6:575.12(46)
Nuevos trigos del Centro de Cerealicultura. **(New wheats from the Centre of Cereal Cultivation).**
Bol. Inst. Nac. Invest. Agron. Madr. 1946 : No. 15 : 129–40.

Two new wheats are described, hybrid 52–3–40 and Ideal. The former, from Candeal de la Sagra x (Hope x Extremo Sur Argelino), is a variety with superior milling and baking quality adapted to moist unirrigated soils. Ideal (hybrid 216–1–40), from (Mentana x Extremo Sur Argelino) x Reward, is also characterized by superior milling and baking quality; it is an early wheat adapted to cool conditions and both to irrigated and unirrigated soils.

176. 633.11–1.421(82)
Instrucciones para la siembra, conducción, cosecha y análisis de los ensayos comparativos territoriales "standard" con trigo durante el año 1944/45. **(Instructions for the sowing, raising, harvesting and analysis of comparative territorial "standard" wheat trials during the year 1944–45).**
"Granos" Semilla Selecta, B. Aires 1946 : **10** : Nos. 7, 8 and 9 : 41–49.

A standard technique is described for carrying out comparative trials of wheat varieties in Argentina.

177. Jakubciner, M. M. 633.11–1.524(49.8)
(The wheats of Bessarabia and the Northern Bukovina).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : Nos. 4–5 : 60–69.

The area in question represents an ancient centre of wheat cultivation. The local varieties are distinguished by high quality, but yields are relatively low since little or no intensive breeding work has been carried out. These local populations provide invaluable material to serve as a basis for breeding work however, and a study of the wheats of the area has been made, based on published literature and the world Wheat Collection at the Leningrad Institute of Plant Industry. The main varieties of *Triticum durum* are of the Kubanka, Arnautka and Garnovka type, though many others exist in smaller quantities.

Of the soft wheat varieties, Girka is still the most popular; it is a mixture of types as regards ear colour, awns, etc., and there are even references in the literature to forms that are autumn sown. A more recent variety is Ulka; this is also a high quality variety, and apparently both spring and winter forms exist. *T. compactum* and *T. dicoccum* are also found.

The winter wheats consist entirely of *T. vulgare* forms, some ancient local varieties, and others introduced from adjacent countries. One of the most interesting varieties is Banatka, which has served as parent for a great number of popular varieties such as Ukrainka, Zemka, Stepnjačka and Durable. It too is a mixture of types, and different forms occur in different areas; both spring and winter forms are known.

The shortest vegetation period is found in the Rumanian varieties Todereşti 32 and 15; the former is a selection from a local strain, the latter a selection from the American variety Tenmarq, itself a product of hybridization between varieties from this part of Europe, namely Red Fife and Krymka. A further selection from Todereşti 15, characterized by greater winter hardiness, has been named Bendery 32–A. Another high yielding variety of high baking quality is Cenad 117, a selection from a western Rumanian Banatka. Certain bred varieties from the U.S.S.R., such as Ukrainka and Kooperatorka, and from Hungary, such as Bankuti 1201, are also found.

178. Rodriguez del Rivero, A. 633.11–1.524(73)
Documento concerniente a la introducción del trigo en América.
(Document relating to the introduction of wheat into America).
Rev. Argent. Agron. 1947 : **14** : 173–75.

A manuscript has been discovered at Jerez, Spain, suggesting that the first wheat sown in America might well have been introduced by Columbus from the neighbourhood of this town.

179. Ryžeĭ, I. P. 633.11–1.524:575(47)
(Breeding winter wheats in Kirgizia).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : No. 6 : 26–30.

A brief outline is given of the types of wheat grown in the different zones of Kirgizia, a mountainous region with extreme variations of climatic conditions. Although the local wheats are no better than Ukrainka 246 in yield, they possess a number of valuable characteristics such as large grain (1000 grain weight 50–60 grm.), freedom from shattering and many diseases, and high grain quality; they are prone to lodge however in good soil.

Efforts have been made to use these valuable qualities in breeding, both by selection and hybridization. Crossing is often effected by sowing the seed parent in the central drill of a 5-row seed drill, the two rows at each side being sown with the pollen parent. The seed parent is emasculated and the pollination allowed to take place naturally. This method has been found preferable particularly in interspecific crosses.

Selecting for high germination energy is used as a means of breeding forms resistant to smut. Several resistant varieties have been selected; Erythrospermum 3 is resistant to bunt, is distinguished by high baking quality, and slightly exceeds Ukrainka 246 in yield; Erythrospermum 9 is resistant to loose smut. Other new varieties exceeding the standard, Pseudo-meridionale 122-a, in both quality and yield are enumerated.

180. 633.11–2.111–1.521.6:631.531(48.5)
SUNDELIN, G. 633.14–2.111–1.521.6:631.531(48.5)
Årets höstsäd. **(The year's autumn grain).**
Lantmannen 1947 : **31** : 739–41.
A survey is given of the results of experiments conducted at various centres and in various localities in Sweden to determine the effect of time of sowing upon winter hardiness of varieties of wheat and rye. Some Danish results are also cited.
Sowing time and cold, diseases and pests, time of ripening and particularly stiffness of straw are all important factors in cold resistance and should be taken into account in choosing varieties for various localities.
The suitability of many Swedish wheats and Finnish ryes to different regions of Sweden is briefly recorded.

181. CHINOY, J. J. 633.11–2.112–1.521.6(54)
How drought affects Indian wheats.
Indian Fmg 1947 : **8** : 72–74.
During the last five years various experiments have been conducted at the Indian Agricultural Research Institute on drought resistance in wheat.
Experiments on a large number of Indian and foreign wheats have shown that the yield is reduced by low moisture level and high temperature during the ripening period. Varieties with suitable vegetative periods must therefore be chosen for cultivation in the various regions of India, so that atmospheric drought does not occur at the time of ripening.
Wheat varieties have also been tested for their resistance to wilting. It was found that at the beginning of the tillering stage all the varieties tested were highly drought resistant. Even after a desiccation period of 15 days, including a seven-day period of permanent wilting, the wheat not only recovered from the injurious effects of the drought but also gave a slightly higher yield of grain than the normally watered controls. This result shows that where irrigation is practised, the process can be delayed for about 45 days after sowing, thus saving valuable irrigation water.
Three months of pre-hardening to induce drought resistance were tested, with promising results.
Experiments were also carried out on the limits of desiccation beyond which vitality is lost. Seeds were germinated under conditions of a restricted water supply and then gradually desiccated at a given stage of growth. It was observed that completely desiccated seedlings in which the coleoptile had reached a length of 1 to 2 cm. and the rootlets a length of 3 to 4 cm. thoroughly revived. Even after a storage of about eight months such desiccated seedlings recovered and grew to normal healthy plants.

182. ROSEN, H. R. 633.11–2.4–1.521.6:575(76.6)
Breeding wheat to combine resistance to leaf rust, speckled leaf blotch, and glume blotch.
Phytopathology 1947 : **37** : 524–27.
Selections of the crosses Fultz selection C.I. 11512 x Hungarian C.I. 4830–1 (C.I. 12017) and (Red Rock x Hope) x C.I. 12017 offer promise of combined resistance to leaf rust (*Puccinia rubigo-vera* var. *Tritici*), speckled leaf blotch (*Septoria Tritici*) and glume blotch (*S. nodorum*).

183. TAI, S. N.,
CHIANG, P. C. and
WANG, W. J. 633.11–2.421.9–1.521.6:575(51)
(Breeding wheat for scab resistance).
Nung Pao 1941 : **6** : 616–25.
The results of experiments on scab resistance in wheat, carried out during the period 1937–42, are summarized. Artificial inoculation tests were found to be more reliable than tests of naturally occurring infection. Among the 41 varieties tested, only one showed immunity; 13 varieties were classed as resistant; the remaining varieties were either susceptible or very susceptible. Some of the resistant varieties were late maturing and low in yield, and could therefore be used only as breeding material; three varieties, however, were found to be sufficiently early and high yielding, and are recommended for sowing on a large scale.

No consistent and significant correlation was found between the percentage loss in the ear as a result of scab infection and the percentage of diseased ears or that of diseased plants. The former figure could not be used as a measure of disease resistance.
Correlation between husk colour and scab resistance was found. Most of the red husked varieties were resistant, while the white husked varieties were susceptible. The characters of husk colour and scab resistance are probably genetically linked. Other characters such as the presence of awns, the length of the hairs on the rachilla, compactness of the inflorescence, time of tillering and time of flowering, showed no relation with scab resistance.

184. Bamberg, R. H.,
Holton, C. S.,
Rodenhiser, H. A. and
Woodward, R. W. 633.11–2.451.3–1.521.6(73)
Wheat dwarf bunt depressed by common bunt.
Phytopathology 1947 : **37** : 556–60.

It has been found that common bunt (*Tilletia foetida*) has a depressing effect upon the development of dwarf bunt (*T. caries*). This effect was shown irrespective of the physiological races of both diseases included in the experiments and all five wheat varieties tested. The nature of this inhibition is unknown. It was also noted that dwarf bunt infection stimulates tiller production.

185. Popp, W. 633.11–2.451.3–1.521.6:578.08
A rapid method of examining wheat heads for bunt infection.
Phytopathology 1947 : **37** : 418–20.

A simple method of detecting bunt infection in heads of wheat is described, which is based upon the observation that bunted heads of ripening wheat are more conspicuous immediately following heavy rain. Immediately prior to examination the harvested ripe heads are soaked in water; examination for the disease is carried out while the heads are still wet, the bunt balls becoming swollen and much darker as a result of the treatment. It is believed that the method should prove particularly useful where a large number of heads has to be examined for bunt infection. It has been found that as many as 2500 heads of wheat can be examined by one person in an hour.

186. Tsai, H. 633.11–2.452–1.521.6:575.12(51)
(Genetic studies on leaf rust of wheat).
J. Agric. Ass. China 1945 : Suppl. No. 50 : 24–25. (Abst. 25th Annu. Mtg.)

Leaf rust is a serious desease of wheat in China. No resistant varieties have so far been found in Szechuan. Crosses were therefore made between introduced resistant varieties and local wheats. Progenies were inoculated and planted in the field. The F_1 data obtained from 11 crosses showed that in all cases resistance to leaf rust was dominant. From the data on the F_2, F_3 and F_4 generations it was concluded that inheritance of resistance is controlled by not more than three genes, and that the development of resistant varieties by hybridization is a definite possibility.

187. Swenson, S. P.,
Buchholtz, W. F. and
Grafius, J. E. 633.11–2.452–1.521.6:581.46:575.1
Complementary genes for leaf rust resistance and the inheritance of stem rust reaction and awnedness in a spring wheat cross.
J. Amer. Soc. Agron. 1947 : **39** : 739–49.

The literature on the genetics of resistance to leaf rust, *Puccinia rubigo-vera* var. *Tritici* (Erikss. et Henn.) Carl., and stem rust *Puccinia graminis* var. *Tritici* Erikss. is reviewed.
Data are presented concerning the inheritance of leaf rust resistance, stem rust resistance and awnedness in the progeny of a cross between two varieties of *Triticum aestivum* L., viz. Thatcher (C.I. No. 10003) and Triunfo (F.P.I. No. 104138).
The F_2 and F_3 segregations for mature plant resistance to leaf rust appeared to indicate that complementary dominant genes, one from each parent, were involved. Since there was some indication that modifying genes might be present, however, it was also suggested that one parent might have contributed two genes, non-complementary to each other, but

complementary either singly or in combination with one gene contributed by the other parent. It was shown that the complementary effect did not result from the conditioning of resistance to different races or groups of races by the genes from Thatcher and Triunfo respectively. The subsequent breeding behaviour of resistance indicates that the leaf rust resistance of Thatcher x Triunfo derivatives is more effective than that observed in certain Hope derivatives.

A wide range of resistance to stem rust was exhibited by the progeny of the cross. Inheritance of Thatcher's resistance to stem rust appeared to involve at least two or three recessive genes.

F_2 and F_3 segregation for awnedness showed that one gene pair is involved. No transgressive segregation of awn types was observed.

χ^2 tests for independence of the three characters showed no indication of linkage.

188. Chu, F. N. 633.11–2.6–1.521.6(51)

(The possibility of obtaining nematode resistant varieties of wheat).

J. Agric. Ass. China 1945 : Suppl. No. 50 : p. 30. (Abst. 25th Annu. Mtg).

Investigations on nematode resistance were begun in 1936; over 6000 varieties of wheat collected from different parts of China have been tested. Only three varieties have been found which possess promising nematode resistance, viz., P.C. 876, P.C. 171 and Hsuchow Nematode Resistant. During a seven year period the average percentages of root knot due to nematode shown by these three varieties are as follows: P.C. 876, 0·01%; P.C. 171, 0·06%; and Hsuchow Nematode Resistant, 0·07%. The controls gave the following results: Tsinta 2905, 7·66%; Kiangtungmen, 9·23%; and Chungnung, 6·30%. It is noted that the figure for the Chungnung variety refers only to the results of three years.

The yield of the resistant varieties is also higher, particularly in nematode infested districts. Unfortunately P.C. 876 is very late maturing, but this defect can probably be overcome by crossing the variety with early maturing wheats.

189. 633.11–2.8–1.521.6:578.08

McKinney, H. H. 633.16–2.8–1.521.6:578.08

Wheats resistant to and immune from mosaic in nursery tests are susceptible when inoculated manually.

Phytopathology 1947 : **37** : p. 441. (Abst.).

Several lines of wheat which have shown a very high degree of resistance or immunity against *Marmor Tritici typicum* and *M. T. fulvum* in field tests were grown in non-infested soil in the greenhouse at temperatures favourable to infection. When inoculated with fresh extracts of the viruses, the lines developed strong mosaic symptoms. It is suggested that these lines possess quantitatively inherited resistance to virus, or are resistant or immune against some vector inhabiting the soil. In similar tests of four barley lines, however, reaction to the viruses in field and greenhouse tests showed close correspondence.

190. 633.11.0014(48.9)
633.14.0014(48·9)

Beretning fra Statens Planteavlsudvalg for finansaaret 1941–42.

(Report of the State Committee for Plant Cultivation for the financial year 1941–42).

København 1942 : Pp. 112.

This annual report is on parallel lines to that reviewed in Abst. 212.

The following information is gleaned from the discussion of the research programme for 1942–43:—

Pajbjerg Konge [Pajbjerg King] wheat was recommended for recognition as meriting the designation II* for superiority.

Maria rye is described as a Brandenburg variety, requiring good soil.

Varieties of horse beans (*Vicia Faba*) from Højer, Ribe and Øtoftegaard are to be compared with Strube; their names and those of the lupins also to undergo trials are to be inserted in the programme.

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* II in Danish plant breeding is a mark of distinction and does *not* mean second class.

Assistance was promised in obtaining foreign potatoes from abroad for variety trials. Samples are being multiplied at Tylstrup.
Next year seed of Danish strains of bird's-foot trefoil is expected to be available.
Soya bean has given poor yields in experiments comparing different crops; opium poppies also gave a poor yield in 1941, in spite of previous good performances. The proper criteria for tobacco leaf were discussed.
Variety trials are also to be made of hazel nuts and asparagus. Seed production from selected pairs of asparagus plants is planned.
The question of establishing an Experimental Station for the Østjylland [Eastern Jutland] region has been raised.
Suggested alterations in the regulations governing the use of stock or commercial seed in strain trials are mentioned.

191. 633.11.0014(48.9)
HANSEN, H. H. H. 633.13.0014(48.9)
Lokale Forsøg og andre Planteavlsarbejder. (**Local trials and other work of plant cultivation**).
Beretn. Planteavl. Lolland-Falster 1939 (1940) : 14–97.

Wheat
A wheat trial of French, Belgian and Dutch varieties is recorded and also one comprising Abed Borghvede, Trifolium Rekord and Pajbjerg Konge and some foreign wheats, Als being included in both experiments. Notes are given on the origin of some of the varieties including Jonquois and Jubilee, whose origin and satisfactory performance are described in detail. Both are being raised by the firm A. Nielsen and Co. and are to be called Anco I and Anco II respectively.

Oats
A further report is given on Abed No. 17 (cf. Abst. 192) in five trials with Swedish oats and the English variety, Marvellous. Abed No. 17 is specially suited to marsh and bog land but may later on even replace Ørn and Sol [Sun] on ordinary agricultural land.
Trials of Swedish and other foreign barleys and wheats were also conducted.

Clover
In trials of five strains of early clover, Lofa and Hjælm, which are very similar, gave 10 and 5% more respectively than Hinderupgaard I and Tystofte I, and 5 and 3% more than Halvsildig Tystofte I [Semi-late Tystofte I]; Lofa and Hjælm have the additional advantages (1) of giving a little more of their total yield at the second and subsequent cuts, i.e. at a time when grazing is usually scarcest; and (2) of doing well where other early clovers will not grow.

Sugar beet
In trials with four Danish strains and Sammes Klein Wanzleben, the Danish strain Hunsballe gave the highest yield of roots and of sugar, but was inferior in percentage sugar to the rest which were all factory beets.

192. 633.11.0014(48.9)
VESTERGAARD, H. A. B. 633.11:575(48.9)
Abed Planteavlsstation. (**Abed Station for Plant Cultivation**).
Beretn. Planteavl. Lolland-Falster 1939 (1940) : 3–13.

Wheat
The varieties of wheat grown at the Abed Station were Als, Trifolium Rekord, Abed Borg (No. 112), Abed No. 32, Pajbjerg Ideal, Pajbjerg Konje, Svalöf Skandia II, Svalöf No. 1157 B and Weibull's Aering II. A report on their yields after four years and a preliminary report after two years trials is given here.
No. 112, namely Abed Borg wheat, which has been released to farmers, has consistently taken first place either with or slightly above Als in yield of grain.
Abed 32, a more recent variety than Borg which it greatly resembles during growth, is a half-sister of Borg [Castle], being derived from Trifolium 14 x Standard. Borg is derived

from Trifolium 14 x Abed No. 19. No. 32 gave very promising results on the Islands. It also seems slightly more hardy than several other recent varieties.
Disease has held up breeding work, but there are some hybrid populations which can be used for line cultivation in 1940.

Barley
Preliminary trials of 13 new lines, of which 12 were derived from Kenia x Maja, were conducted at Abed and at the Experimental stations at Lyngy and Borris to find out which lines were worth including in bigger ordinary trials. Maja and Kenia were used as standards. Drought affected the results: Maja yielded much more grain than Kenia and about half the new lines did so too.

Oats
Seven varieties, including five from the Abed Station, took part in trials. Abed No. 17 yielded slightly less than Ørn [Eagle], while Abed No. 30, a new line from Ørn x Sølv [Silver] yielded most and from 1939 was included in the ordinary trials at 11 experimental stations.
In another experiment with seven varieties on agricultural land Ørn again ranked first, but next came Svalöf No. 1430 and Abed No. 77. No. 77 has, however, long straw, which is not stiff enough.
In other trials of eight varieties at Højer and Tylstrup, Abed No. 17 gave the highest yield of grain and showed a good medium high husk percentage. Its hectolitre weight was the highest of all. The variety will probably be ready after 1941 for use in the localities to which it is suited.
New oat lines are to undergo control experiments in 1940. They are derived from a series of different crosses in which No. 17 was most frequently used as a parent. Out of 780 lines in 1938, there are now 60 of the best ready for planting. Most of them have very stiff straw and many are outstanding in quality.

193. Thomas, I.,
Samuel, L. W. and
Millington, A. J. 633.11.00.14(94.1)
Wheat variety trials on research stations.
J. Agric. W. Aust. 1947 : **24** : 30–42.

A report is given of trials of the following wheats: (1) the new Frisco, Yalta, Gabo and Kendee varieties; new hybrid selections derived from the crosses Sword x Kenya C6041, Marathon x Totadgin, Eureka x Bencubbin, Eureka x Bungulla and Carrabin x Waratah; and six varieties which have been previously tested, Bencubbin, Bungulla, Eureka, Kondut, Koorda and Charter. Information is given on rust resistance, flour strength, yield and other characters.
Eureka and its derivatives have shown susceptibility to a new race of rust which has occurred in the Eastern states.
The new Frisco, Yalta, Gabo and Kendee varieties (cf. *Plant Breeding Abstricts*, Vol. XVI, Abst. 1051) have proved resistant to the rust strains so far occurring in Western Australia, but Frisco is susceptible to the new race which has developed in the Eastern States. Yalta and Frisco were bred by the New South Wales Department of Agriculture, while Gabo and Kendee were developed as a result of investigations at Sydney University. These new varieties are to be more extensively tested.

OATS 633.13

194. Poehlman, J. M. 633.13:576.16:575.3(77.8)
Growing good crops of oats in Missouri.
Bull. Mo. Agric. Exp. Sta. 1947 : No. 501 : Pp. 18.

The origin and characteristics of Fulghum, Columbia, Boone, Clinton, Benton and other recently introduced varieties are discussed from the point of view of their adaptation to conditions in Missouri. Yield data show the superiority of Boone over Columbia in Northern Missouri but, in Central Missouri, Columbia was much less affected by the *Helminthosporium* blight in 1946.

195. HAMILTON, D. G. and BROADFOOT, W. C. 633.13–2.484–1.521.6
The new *Helminthosporium* blight of oats found in Ontario.
Sci. Agric. 1947 : 27 : 446–47.

The oat varieties and selections which have Victoria as a parent and possess its resistance to crown rust (*Puccinia coronata*) are reported to be susceptible to attack by *Helminthosporium Victoriae*. In Ontario, Beacon, Garry and Vicland were attacked, whilst other varieties appeared resistant.

RYE 633.14

196. AVAKJAN, A. A. and FEĬGINSON, N. I. 633.14:581.162.32:575.125
(Results of several years experiments on free interpollination between varieties of winter rye).
Agrobiologija (Agrobiology) 1946 : No. 3 : 3–50.

An examination of the literature leads the authors to conclude that there are no reliable data which indicate that the distance of 1 km. prescribed for the isolation of rye breeding plots is the correct one, or that failure to observe this isolation leads to deterioration. Experiments were conducted to test the point. Plots of 115 sq. m. were sown with stock seed obtained from a number of breeding stations and with open-pollinated seed of the same varieties grown in proximity to a number of other varieties in the variety trials for varying numbers of years.

Comparing the results from material subjected to open-pollination for one, two and three successive generations, it was found that in the majority of varieties there was little or no difference: in a certain number of varieties the material out-pollinated for three years gave slightly higher yields than that out-pollinated only once, certain others showed a slight decrease. The greatest increase obtained amounted to 5·1 c. per ha. (27%), in the variety Veselyi-Podol Petkus, the greatest decrease was 13% in the variety Nemyšljanskaja. Results of 5 to 8 generations of out-pollination as compared with only 1 generation showed an increase of from 1·0 to 3·4 c. per ha. in six varieties, and a decrease of from 0·4 to 4·2 c. per ha. in five varieties, the others being more or less equal.

In 1938/39, in comparisons between stock seed and seed from out-pollination no difference in yield was observed in six out of 26 cases, and in 15 cases there was a slight increase amounting to an average of 4·5 c. per ha; in five cases there was a slight reduction of up to 1·0 c. per ha. The material showing the reduction in yield all came from the same breeding station, and the reduction is therefore thought to be a consequence of the conditions of growing rather than the result of out-pollination. In the following year material from several other stations showed consistent inferiority and again the reduced yields from out-pollinated seeds from these stations are not thought to be ascribable to the out-pollination. Omitting these results, there was still a difference of 1·2 c. per ha. (5%) in favour of the stock seed. It was found however that for this experiment the stock seed supplied by the experiment stations was true élite seed from the breeding plots, whereas in the previous year it had been from the multiplication plots.

The seed out-pollinated for 7–8 generations yielded on an average 3·2 c. per ha. (12%) more than stock seed and only in one variety, Kharkov Petkus 194, was it inferior. The plants from open-pollinated material were also less attacked by diseases, particularly snow mould. Tests of the 1000 corn weight showed that the varieties characterized by high values remained in this top class even after out-pollination; similarly, the varieties with the lowest values remained in the lowest group after out-pollination, though the values rose somewhat with each successive generation of out-pollination. A slight increase from generation to generation was noted also in the intermediate group.

Adjacent plots were sown with varieties displaying contrasting characters; after 1, 2 and 3 generations of open-pollination most varieties had maintained the varietal types; it is pointed out that the two varieties which lost their characteristics were both produced by close breeding and isolation, which according to Lysenko's principle leads to a "debilitated hereditary constitution".

From the results of these experiments it is concluded that by rescinding the 1 km. isolation law for rye in 1939 a great improvement in the quality of the seed will have been effected.

197. NOGGLE, G. R. 633.14:581.192:576.356.5
A chemical study of diploid and tetraploid rye.
Lloydia, Cincinnati **1947 : 10** : No. 1 : 19–37.

In order to compare the chemical composition of diploids and tetraploids at similar stages of development, two sets of experiments were carried out. In the first, unvernalized Rosen rye was used, the diploids and tetraploids being tested at a stage when comparable leaves emerged. In the second set vernalized diploids and tetraploids of Rosen rye were tested at the same chronological age. The chemical differences are tabulated, and the green weight, dry weight, tillering, moisture content and transpiration are also compared. The tetraploids developed at a slower rate, had fewer tillers and a lower rate of transpiration than the diploid plants. The green weights of the tetraploids were equal to or greater than and the dry weights less than those of the diploids. The relationship of tetraploidy to the chemical composition of the tissue was not consistent at different cutting dates or in the vernalized and unvernalized series. It was observed however that the tetraploids had an equal or greater percentage of total nitrogen, reducing sugar, carotene, riboflavin and potassium than the diploids, and their dry tissue contained more chlorophyll and ascorbic acid; they contained a lower percentage of total sugar, non-reducing sugar and calcium than the diploids and the chlorophyll content of the green tetraploid tissue was less than that of the diploid.

198. EKSTRAND, H. 633.14–2.4–1.521.6(48.5)
Några växtpatologiska synpunkter på höstsädes- och vallodlingen i Norrland. (**Some phytopathological aspects of autumn cereal and grassland cultivation in Norrland**).
Växtskyddsnotiser, Stockholm **1946** : No. 5 : 68–73.

The decline of winter cereal cultivation in Norrland could be counteracted if suitable varieties were produced with the necessary resistance to the fungous diseases which destroy cereal crops in winter. Finnish ryes, both land forms and improved varieties, are, in general, considerably more resistant to such fungi than Swedish ryes.

A similar situation is found in regard to clover cultivation in Sweden and especially in Norrland; but here the situation is complicated by the existence of different groups of biotypes of *Sclerotinia Trifoliorum* in different parts of the country. Moreover, different biotypes may occur in one field and climatic changes may cause some particular form to predominate in one year, and another in another year. This naturally complicates resistance trials. In general, however, local strains of clover may be regarded as having acquired a certain resistance to the most prevalent biotypes or groups of biotypes of the locality. Seed production in the locality where the crop is to be grown and the provision of facilities for pollination by bees are also essential for successful cultivation of clover in northern districts.

MAIZE 633.15

199. FEDERER, W. T. and SPRAGUE, G. F. 633.15:519.24:575.125
A comparison of variance components in corn yield trials: I. Error, tester x line, and line components in top-cross experiments.
J. Amer. Soc. Agron. **1947 : 39** : 453–63.

By estimating the variance components and their ratios in hybrid maize combinations arranged in randomized blocks and split plot designs, it has been shown that a single tester provides the most efficient means of estimating specific combining ability, while more than one tester is needed for the most efficient estimate of general combining ability.

200. JENKINS, M. T. 633.15:575.12(73)
Report of the Second Northeastern Corn Improvement Conference, New Brunswick, New Jersey, February 4–5, 1946.
Div. Cereal Crops Dis. Bur. Pl. Indust. Soils, Agric. Engin. Beltsville, Md. **1947** : Pp. 37. (Mimeographed.).

Summaries are given of current investigations on maize and sweet corn improvement at 15

State experiment stations and the Plant Industry Station of the United States Department of Agriculture, Beltsville, Maryland.

In addition, the publication contains the reports of the committees for (1) the uniform designation of hybrids; (2) the formulation of a uniform policy on the release and distribution of inbred lines; (2) sweet corn investigations; (4) the permanent organization of the Northeastern Corn Improvement Conference; and (5) the joint report of the committee on statistical designs and the committee on uniform tests of field maize.

A list of inbred lines released to private growers by state and federal agencies is included

201. JENKINS, M. T. 633.15:575.12(73)
Report of the Third Northeastern Corn Improvement Conference, New Brunswick, New Jersey, February 18–19, 1947.
Div. Cereal Crops Dis. Bur. Pl. Indust. Soils, Agric. Engin. Beltsville, Md. 1947 : Pp. 14. (Mimeographed).

Sessions dealing with future projects of maize and sweet corn improvement are briefly reported.

Reports are included of the special committees on (1) statistical designs; (2) the uniform designation of hybrids; (3) the formulation of a uniform policy on the release and distribution of inbred lines; and (4) sweet corn investigations.

202. MARINO, A. E. and LUNA, J. T. 633.15:575.12(82)
Dos híbridos comerciales de maíz. (**Two commercial maize hybrids**).
Rev. Argent. Agron. 1947 : **14** : 50–60.

Colorado Santa Fe 3 is a double hybrid of the parentage (AF312·2 m x CN113 m) x (BK114·2 m x CH222·1 m). It has yielded 39·3 quintals per ha. at Santa Fe. Details are given of the origin of the inbred lines and of their combining ability.

A hybrid designated Colorado Santa Fe 2 has also been obtained by crossing the variety Colorado Klein with the inbred line BVN m. 3; it has exceeded the yield of Colorado Klein by as much as 45% at the Angel Gallardo Experimental Station.

203. TAVCAR, A. 633.15:575.125
Le maïs huit rangs dans la création d'hybrides productifs. (**Eight-rowed maize in creating productive hybrids**).
Inst. Amélioration Plantes Univ. Roy. Zagreb (Yougoslavie) 217–24.

The results of breeding experiments on maize are discussed.

In the author's own hybridizations between eight-rowed maize and varieties with more than eight rows belonging to the groups *Zea Mays* var. *indentata* and *Z. Mays* var. *indurata*, the F_1 progeny produced more grain than either parent, but were, on the whole, intermediate between the parents as regards the vegetation period, length of the ear, number of rows of seeds, percentage of protein in the grain, and percentage of stem. Hybridizations were also effected between the varieties with more than eight rows in the groups mentioned. It is concluded that eight-rowed maize is one of the best parents for hybridization with these varieties. Further experiments showed that fertility based on genetic factors may be obtained, by using the first generation arising from hybridization of different varieties or lines propagated by self-fertilization, thus making use of heterosis, while combining with it the advantages of inbreeding.

204. ZAPPAROLI, T. V. and BATTAGLINI, G. 633.15:575.42(45)
Varietà di granoturco nane precoci selezionate. Il granoturco "Trentinella" di Pescara. (**Varieties of early dwarf maize obtained by selection. The Trentinella maize from the province of Pescara**).
Opus. Staz. Sper. Maiscolt. Bergamo 1943 : No. 34 : 577–79.

This is an account of a particular variety of early dwarf maize grown in the region of Pescara and improved through mass selection for cultivation in dry regions. This variety had always been known for its good performance, but in the course of time it had almost completely disappeared and was gradually replaced by hybrids no longer showing the typical characteristics of Trentinella. The Experimental Station of Bergamo has undertaken

work of improving maize varieties paricularly suitable for the many dry regions of central Italy. Among such varieties the following have been improved by mass selection with success: Semetta Teso, Precoce di Bagnolo, Tre Nodi, Agostano del Molise, Barbina 14 File (14-rowed Barbina) and Ottofile Piemontese P.38 (Piedmont P.38 Eight-rowed).
A detailed description of the variety Trentinella is given with illustrations. It yields 40 quintals of kernels per hectare. The stalk is flexible and resistant to the wind. The ear grows at a height of 32–36 cm. from the soil and has eight rows of kernels with an average of 35 grains each. E. M. F.

205. ZAPPAROLI, T. V. 633.15:575.42(45)
Varietà di granoturco "Nane Precoci": "Barbino" o "Barbina a 14 file di Tortona". (**Varieties of Early Dwarf maize: Barbino or 14 rowed Barbina from Tortona**).
Opus. Staz. Sper. Maiscolt. Bergamo 1943 : No. 36 : 11–14.
This variety, produced by mass selection, and particularly suitable for sandy, loose soil with deficient rainfall (about 360 mm. per ann.) is based on a local type of uncertain origin and much degraded by hybridization. The variety is described. The roots are numerous and reach rather far down into the soil, providing in this way the necessary water during periods of drought. In fertile soil the variety yields up to three ear, at 30–35 cm. above the soil. In dry soil only one ear develops in the first internode. The colour of the grain is pale, almost white, but the quality of the flour is excellent. E. M. F.

206. MACVICKAR, M. H. and PHILLIPPE, P. M. 633.15–1.557:575.125
More stalks, more corn per acre.
Sth. Plant. 1946 : **107** : No. 3 : 20–21.
An adapted maize hybrid outyielded an adapted open pollinated variety at planting rates of 1, 2, 3 and 4 stalks per hill. The hybrid gave its highest yield at 4 stalks per hill, while the open pollinated variety yielded best at three stalks per hill. The number of ears was directly proportional to the number of plants per acre except where the open pollinated variety was planted at 3 or 4 stalks per hill. In all cases the size of the ears decreased as the number of ears increased.

207. ULLSTRUP, A. J. and BRUNSON, A. M. 633.15–2.484–1.521.6:575.116.1
Linkage relationships of a gene in corn determining susceptibility to a *Helminthosporium* leaf spot.
J. Amer. Soc. Agron. 1947 : **39** : 606–99.
Reaction in maize to the leaf spot disease caused by *Helminthosporium carbonum* Ull. depends upon a factor pair designated *Hm hm*, susceptibility being a recessive character. In order to determine the linkage relationships of *hm*, appropriate crosses were made between a series of translocation stocks, in which the character of sugary endosperm was used 4·0 units to the right of *br*.

208. ZAPPAROLI, T. V. and PARENTI, E. 633.15.00.14(45)
Lo studio sistematico dei granoturchi da foraggio. (**Systematic study of forage maize**).
Opus. Staz. Sper. Maiscolt. Bergamo 1943 : No. 37 : 183–92.
An account is given of field experiments carried out by the Centro di Maiscoltura, Udine, with ten maize varieties, including the Italian Rostrato Dentato, in order to determine their nutritive value as forage. Up to recently little attention was paid to the difference between varieties more suitable for grain and flour production and others more suitable for forage. The experiments were carried out in different kinds of soil. But for a number of reasons the results were not quite conclusive and the experiments are being continued. It has however been proved that the varieties with a longer period of vegetation, and maturing late, are best for forage. E. M. F.

209. Jenkins, M. T. and
Mayer, L. S. 633.15.00.14:575.12
Report of the cooperative uniform comparisons of corn hybrids 1946.
U.S. Dep. Agric., Agric. Res. Admin., Bur. Pl. Indust. Soils Agric. Engin., Div. Cereal Crops Dis., Pl. Indust. Sta. Beltsville, Md. **1947** : Pp. 92. (Mimeographed).

Performance data for maize hybrids and parents, based on the results of 80 tests carried out in 27 different states, are presented. Further tables give the estimated performance of the highest yielding crosses among the parental lines of the single crosses.

BARLEY 633.16

210. Leonard, W. H. 633.16(52)
Barley culture in Japan.
J. Amer. Soc. Agron. **1947** : **39** : 643–58.

Barley is one of the most important crops cultivated in Japan. Almost all the barley grown is common six-row barley (*Hordeum vulgare*), but a few varieties of *H. intermedium* and *H. distichum* are also used. Naked barley is more widely cultivated than the covered type, largely because the chief use of the crop is for human food. In addition to an account of the geographical distribution of barley in Japan, cultural practices and utilization, the article gives information on regional types and varieties, and the resistance of the more important covered barley varieties to snow blight, cold, dwarf leaf rust, scab and powdery mildew.

211. Eĭhenbaum, E. V. 633.16:575(47)
(**Breeding barley at the Falen State Breeding Station**).
Selekcija i Semenovodstvo (Breeding and Seed Growing) **1946** : **13** : No. 6 : 47–49.

The breeding methods employed at the station are outlined. The Viner barley, one of the best malting barleys in the Soviet Union, produced by the station, has now been surpassed by a number of the station's new varieties, which have exceeded it in yield and grain size and ripen at the same time or somewhat earlier. The varieties are described; they are all selections from local Russian or Czechoslovakian barleys.

A naked barley selection, Uspeh [Success], is described as being equal to Viner in yield and surpassing it in earliness; it ripens in 65 days as compared with 75 for Viner. Its grain is larger and contains 15% protein as against 12% in Viner.

All the new varieties respond well to improved cultural conditions and are drought resistant.

212. 633.16:575(48·9)
633.16.00.14(48.9)
634.00.14(48.9)
Beretning fra Statens Planteavlsudvalg for finansaaret 1940–41. (**Report of the State Committee for Plant Cultivation for the financial year 1940–41**).
København 1941 : Pp. 111.

This report contains exactly parallel information regarding the organization and staff, etc., of the Danish official stations, institutions and other bodies concerned with plant cultivation in Denmark to that for 1939–40 mentioned in Abst. 525. Observations are recorded on local plantations of different varieties of fruits in Denmark and, in the discussion on the research programme for 1941–42 some new Abed barleys are referred to as material for the year's trials; they are stiffer strawed than Kenia, but not superior in yield.

213. Lavallard, M. L. 633.16:575(76.7)
New cold-hardy barley released by Arkansas.
Sth. Seedsman **1947** : **10** : No. 8 : 21, 44.

The new Fayette six-rowed winter barley is a selection of the so-called "Manchuria, C.I. No. 245" barley. Its advantages are high-yielding capacity, good winter hardiness, and large and plump seeds. The selection is rough-awned, however, and somewhat susceptible

to diseases, particularly to scald. The cultivation of Fayette will probably be limited to northeastern Arkansas and southern Missouri, and the variety is only recommended until a more disease resistant variety has been developed.

214. Gregory, F. G. and
Purvis, O. N. 633.16:581.162.51
Abnormal flower development in barley involving sex reversal.
Nature, Lond. 1947 : **160** : 221–22.

The abnormal development of barley flowers involving the production of carpel-like and intermediate structures instead of stamens is described. If any pollen at all is produced self-fertilization occurs. Completely male sterile flowers can be cross-pollinated and produce normal grain.

215. Tekeli, S. T. 633.16:581.6(56)
Arpalarin terkip ve keyfiyeti üzerine hava gidişinin ve ekim mevsiminin tesirleri. (**Influence of climatic conditions and date of sowing on composition and quality of barleys**).
T. C. Ziraat Vekâleti Yüksek Ziraat Enstitüsü Çalişmalarindan Ankara 1940 : No. 108 : Pp. 71.

The importance of barley cultivation in Turkey and the effects of climatic and other conditions on quality are discussed. Barleys grown at the Ankara Seed Improvement Station were investigated for composition and quality from 1932–37. Each year winter and summer varieties representing seven numbered varieties of improved barley grown at the station, were sown and the grain subjected to mechanical and chemical analysis. As the results obtained at Ankara may not apply to other parts of the country, similar experiments should be made for all types of climatic conditions.

216. 633.16–1.524(79.6)
633.16:575(79.6)
Huge Aberdeen barley family parents of new Idaho strain.
News Lett., Idaho 1947 : **33** : No. 4 : p. 1.

A brief popular article is given on the barley varietal collection at the Idaho Agricultural Experiment Station. The collection is considered to be probably the largest and most complete barley collection in the world. In 1946, it contained a total of 4360 varieties. Mention is made of the new high-yielding Gem barley.

217. Sarasola, J. A.,
Favret, E. A. and
Vallega, J. 633.16–2.421.1:576.16:631.521.6(82)
Reacción de algunas cebadas con respecto a *"Erysiphe graminis hordei"* en Argentina. (**Reaction of some barleys with respect to *E. graminis hordei* in Argentina**).
Rev. Argent. Agron. 1946 : **13** : 256–76.

The reaction of a large series of Argentine barley varieties to the endemic race Arg. 1 of *E. graminis* var. *Hordei* is recorded. Monte Cristo C.I. 1017, West China and Engledow India proved immune; Multau x Glabron 4884, Cebada Negra [Black Barley], Anoidium, Nigrate C.I. 2444, Lion x Palmella Blue 3877 and Gopal C.I. 1991, highly resistant; and *H. distichum* var. *nigrinudum*, H.541 (*H. polysticum* var. *nudum* from Japan) and Importada Brügger (04) 35 moderately resistant.
A footnote mentions that a second Argentine biotype of the pathogen has been discovered.

218. Wei, T. C.,
Hsu, W. Y. and
Chen, J. T. 633.16–2.451.2:576.16:631.521.6(51)
(**Physiological specialization of covered smut of barley**).
J. Agric. Ass. China 1945 : Suppl. No. 50 : 26–27. (Abst. 25th Annu. Mtg).

Using the barley varieties Manchuria, Saitama, Achadaha, N-373, Hanna and H24–20 as differential hosts, ten physiological races of covered smut were identified in collections from the Kiangsu, Szechuan and Shensi Provinces of China.

219. FJAERVOLL, K. 633.16.00.14(48.1)
Korndyrkinga i Troms og Finnmark. **(Barley growing in Troms and Finmark).**
Meld. Stat. Forsøksgard Holt. 1938 (1939) : H4–H51.
Meld. Stat. Forsøksstassjoner Plantekult. 1938 (1940).
Tillegg H till Landbruksdirektørens årsmelding 1938.
This report records various trials with barley varieties (from about 1923 to 1938) including Fløya, Solen, Polar, Jotun [Giant], Dönnes, Dane and Maskin. Earliness was among the characteristics studied.

MILLETS AND SORGHUM 633.17

220. PLOTNIKOV, N. JA. 633.171(47)
(Varietal sowings of millet).
Selekcija i Semenovodstvo (Breeding and Seed Growing) **1946 : 13 :** No. 6 : 62–65.
Millet cultivation was greatly intensified in the U.S.S.R. during the war years, and record yields of over 200 centners per hectare are reported for certain areas. In some places the area sown with improved varieties has proportionately increased, but in certain other places it has actually diminished, partly owing to shortage of seed. Out of 62 varieties officially tested in 1944, 37 were recommended for cultivation, 19 of these being bred varieties and 18 local varieties. The variety most extensively cultivated is Saratov 853, a dry-land variety, which is described fully. It is insufficiently frost resistant and early for cultivation in certain zones, where it is surpassed by other, better adapted varieties; some of these are also described, including Kazan 506, Novourensk 241, Dolinsk 86 and Omsk 9.

221. FIRSOVA, M. A. 633.171:581.6(47)
(Characteristics of some recommended varieties of millet as regards extraction and quality of grits).
Selekcija i Semenovodstvo (Breeding and Seed Growing) **1946 : 13 :** No. 6 : 58–61.
Millet varieties have been studied in respect of size, form, colour, and uniformity of grain, 1000 grain weight, hectolitre weight, husk percentage, percentage extraction of grits, rapidity of grinding, and quality, colour, flavour, etc., of the grits and of the gruel produced from them; consistency of the gruel, rate of cooking and degree of swelling, in weight and in volume, were included as characters comprising quality.
One of the most reliable criteria of a variety proved to be the extraction rate, which varied from over 80% in the best varieties to 73% in the worst. The quality and flavour of the gruel, however, is often only medium in the varieties with the highest extraction, and all characteristics must be taken into account when making a final appraisal of a variety.

222. STEPHENS, J. C. 633.174:581.46:575.061.6
An allele for recessive red glume color in sorghum.
J. Amer. Soc. Agron. **1947 : 39 :** 784–90.
The discovery is reported of a recessive gene in sorghum for red glume colour, having the same association as *Q*, the dominant gene for redness has with the genes for brown subcoat nucellar layer, *Bb*, and green striped plant, *Gs gs*. This recessive gene is designated q^r. The dominant red glumed varieties used in the crosses were all of Asiatic origin except Acme broomcorn and Honey sorgo, while the black and recessive red glumed varieties were largely of African origin. The dominance of the gene for red glumes reported by Vinall and Cron in Red Amber sorgo is explained on the assumption that their strain was selected from a broomcorn hybrid.

RICE 633.18

223. MOH, P. C. 633.18(51)
(Deep water paddy of Kwangtung and Kwangsi).
Nung Pao **1944 : 9 :** 390–91.
The cultivation of deep water rice in the Kwangtung and Kwangsi provinces is surveyed. The rice is generally five to six feet tall, and may grow taller with rise of the water. This

type of rice tolerates total submergence for a week, and can germinate in deep water. It has a long growth period, from March or April to September or October, and is a short day plant. The quality of the rice is poor, and the grain is generally used for wine making. The type was probably introduced from China or Indo-China.

224. BRAVO, A. F. 633.18(82)
El cultivo del arroz en el noroeste de la provincia de Corrientes. (**The cultivation of rice in the north-east of the province of Corrientes**).
"Granos" Semilla Selecta, B. Aires 1946 : **10** : Nos 10, 11 and 12 : 26–32.
Descriptions are included of the four varieties Blue Rose, Japonés Pragana, Japonés Gigante and Yamaní sel. M.A.

225. RJABOV, I. E. 633.18:575(47)
(**Varieties of rice for irrigated agriculture in the Trans-Volga**).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : Nos 7–8 : 72–74.
By crossing the early maturing irrigated variety Karataljskiĭ 86–79 with the medium-early rainfed variety Jukto selections have been produced which mature 13–33 days sooner than the parents. All hybrid generations were grown with irrigation at 5–6 day intervals and in this way selections were obtained which gave quite good yields of 17·5 to 22·3 c. per ha. on totally unirrigated ground. Several promising varieties will be available for cultivation in the Trans-Volga when the irrigation project for that area is terminated.

226. GONÇALVES, A. P. 633.18:575(81)
O arroz em Minas Gerais. (**Rice in Minas Gerais**).
Ceres, Brasil 1940 : **1** : 322–30.
Brief mention is made of the rice varieties introduced into Minas Gerais, Brazil, and methods of improving them are outlined.

227. KUNG, P. 633.18:575.42(51)
(**The breeding and distribution of four varieties of rice in Hunan**).
Nung Pao 1944 : **9** : 382–89.
An account is given of four improved rice varieties now widely cultivated in Hunan, China, which originated as pure line selections of local varieties. In addition to detailed information on the origin, production and characteristics of the varieties, the paper reports the results of breeding experiments, regional trials, and extension work.

228. 633.18:576.16:582
CHATTERJEE, D. 633.18:581.9
Botany of the wild and cultivated rices.
Nature, Lond. 1947 : **160** : 234–37.
The changes which cultivated rice, *Oryza sativa* L., has undergone in its evolution from the wild rice of India are outlined. Reference is made to various descriptions of this wild species of *Oryza* under different names. The wide variation of forms included under the name of *O. sativa* probably represent not one but several species. *O. breviligulata* A. Chev. et Rochr. is regarded as the ancestor of *O. glaberrima* Steud., which is cultivated in west tropical Africa.
The views of various authors concerning the identity of the different parts of the rice spikelet are discussed.
The distribution is indicated of other genera of the tribe Oryzeae, and of the 23 species of the genus *Oryza* which the author considers good species.

229. LOO, T. Y. 633.18:581.192(51)
(**A biochemical study on Chinese rice**).
J. Agric. Ass. China 1945 : Suppl. No. 50 : 10–11. (Abst. 25th Annu. Mtg).
Investigations were carried out on glutinous and non-glutinous rice varieties cultivated in the Kwangsi and Kweichon Provinces.

The amino acid content was found to be highest in Wan-Koo and lowest in Tsao-Koo. The varieties fell into the following decreasing order of amino acid content: Wan-Loo, Ma-Koo, Gai-Shei-Pe, Ye-Koo-Tze, Wang-Ing, Erh-Huang-Tsao and Tsao-Koo.
With regard to protease activity, the varieties analysed showed the following decreasing order of activity: Wan-Koo, Tsao-Koo, Ye-Koo-Tze, Wan-Ing, Man-Koo and Yunnan-Pe.
No correlation was found between total nitrogen, amino acid content and protease activity.
The varieties also showed differences in titratable acidity, hydrogen ion concentration and buffer activity. No correlation was found between these three properties.
The glutinous and non-glutinous varieties showed marked differences in peptization by organic acids.

230. Kwan, S. K. and
Tu, T. S. 633.18:581.46:581.49:575.11
(Inheritance of hairiness in cultivated rice).
J. Agric. Ass. China 1945 : Suppl. No. 50 : p. 5. (Abst. 25th Annu. Mtg).

Varieties of cultivated rice differ in the degree of hairiness of the flowering glumes. The cross between Shungta 312, a glutinous awned variety with hairy colourless glumes, and Binastian, a non-glutinous awnless variety with coloured and less hairy glumes, gave a 3 : 1 ratio of hairy and less hairy plants in the F_2 generation, indicating that the character of hairiness is determined by a single dominant gene; the F_3 data confirmed this result. The gene for hairiness is designated P_c. It was found that the gene had no linkage relationships with the genes determining the colour of the husk, colour of the glume, presence of awns and glutinous endosperm.

231. Pan, C. L. and
Kung, P. 633.18–2.112–1.521.6(51)
(Drought and the cultivation of rice in the southwest).
Nung Pao 1941 : **6** : 473–76.

Rice cultivation in the southwestern provinces of China was investigated in relation to drought. From the results of three years' experiments it was concluded that four possible methods could be used: (1) the use of "dry land" rice, five varieties of which gave successful results under experimental conditions; (2) the planting of treated seedlings to avoid the effect of spring drought, the young seedlings being subjected to partial drying treatment to make them drought resistant and early maturing; the treated rice could then be later than usual without seriously affecting the time of harvest; and (3) direct sowing instead of transplantation; this practice was found to shorten the vegetative period.

232. Jodon, N. E. 633.18–2.484–1.521.6:581.6:575.12
Three new rice varieties from Rice Experiment Station (Crowley, La.) made available to growers for trial.
Rice J. 1945 : **48** : p. 10.

Three new rice varieties developed at the Rice Experiment Station, Crowley, La. are described.
Magnolia (C.I. 8318) originated from the cross Improved Blue Rose x Fortuna. It is as early as Prolific and has grain similar to that of Blue Rose but slightly smaller. Its yield compares favourably with that of Early Prolific and it should mill practically as well as Blue Rose. It is resistant to *Cercospora* leaf spot disease and probably to straight-head. The plant is sturdy, not quite so tall as Early Prolific and while it does not shatter, it threshes readily.
Blue Rose 41 (C.I. 8317), which originated from a *Cercospora* resistant Blue Rose type plant in a plot of Improved Blue Rose, is similar to Blue Rose. Besides resistance to the *Cercospora* race which affects it Blue Rose showed only a trace of white-tip symptoms, but it is susceptible to another race of *Cercospora*. It has proved very similar to Improved Blue Rose in maturity and in yield, grain type and cooking quality. The plant is somewhat sturdier than Blue Rose, lodges less and usually remains green later in the fall.
Delrex (C.I. 8320), which was selected from the cross Rexoro x Delitus, is a late maturing, long grain variety with the scented flavour of Delitus. It matures a few days earlier, grows somewhat taller, yields nearly as well, is smooth hulled and has a thicker grain than Rexoro.

233. DAVIES, W. 633.2:575
Research and practice in ley farming.
Foreign Agric. U.S. Dep. Agric. 1947 : **11** : 141–43.
Reference is made to grass breeding at Aberystwyth and the use of British seed overseas.

234. 633.2:575(42.9)
NICHOLS, J. E. 633.32:575(42.9)
Grassland and animal production.
Nature, Lond. 1947 : **160** : 249–50.
Reference is made to recent progress in plant breeding methods at Aberystwyth and the production of new strains of grasses and clover.

235. 633.2:575(76.6)
Good pasture for Oklahoma.
Circ. Okla. Agric. Exp. Sta. 1947 : No. 125 : Pp. 31.
Mention is made of selection and breeding investigations on native grasses at the Oklahoma Agricultural Experiment Station. Two improved strains of side-oats grama and the Oklahoma No. 1 strain of switchgrass have been released to seed growers. Improvement work is also being carried out on blue grama, buffalo grass, Bermuda grass and several other native grass species.
The possibility of producing hybrid grasses on the same principles as hybrid maize is receiving attention.
In addition, many new grasses from other states and from foreign countries have been tested. Weeping love grass is now being widely planted. Several hundred selections of smooth brome are under observation. Sweet Sudan grass is being bred.

236. 633.2:576.16(42)
STAPLEDON, R. G. 633.322:576.16(42)
The precise value and application of the Aberystwyth and other strains of herbage plants.
J. Brit. Grassland Soc. 1947 : **2** : 113–18.
The need for planning for an increased acreage of grass leys in view of the increased livestock population possible in a few years' time in Britain is discussed. The author emphasizes the importance of herbage plant breeding and thorough knowledge of the value of strains, in conjunction with a well-organized home seed production industry; and examines the conflicting views on the performance of Aberystwyth and other strains of white clover, timothy, ryegrass and cocksfoot.

237. 633.2:581.163:575.11
MYERS, W. M. 633.2:576.312.35
Cytology and genetics of forage grasses.
Bot. Rev. 1947 : **13** : 319–67, 369–421.
The behaviour of the known genes in *Sorghum* and other grasses is described.
It is pointed out that the variations observed in natural populations are acted on by natural selection, and that mass divergence of type under different environmental conditions has been reported in some grasses. The formation of geographical races is attributed to this process of divergence under pressure of natural selection.
Vegetative apomixis in *Festuca*, *Poa* and *Deschampsia*, and agamospermy in *Poa* species including aneuploids are discussed. The use of the progeny test has revealed a wide range in the degree of apomixis. The cytological basis of apomixis in different species is also discussed. The author considers that the most probable explanation of the origin of apomixis is that it is conditioned by genetic factors and he cites evidence from *Poa* to support this hypothesis.
A list of the diploid chromosome numbers of the Gramineae is given and the data discussed. Irregularities in meiosis are described.
The use of cytological data in establishing systematic and phylogenetic relationships and Avdulov's attempt (cf. *Plant Breeding Abstracts*, Vol. III, Abst. 40) to use cytological information as an aid in classifying the Gramineae are discussed. Evidence concerning basic chromosome numbers, chromosome morphology and the occurrence and behaviour of centric fragments and supernumerary chromosomes is reviewed.

Polyploidy is discussed and the occurrence of intraspecific chromosome races is noted as a striking feature in the Gramineae. There appears to be no strict parallel between differences in chromosome number and differences in morphology in *Panicum virgatum* but Müntzing (cf. *Plant Breeding Abstracts*, Vol. VI, Abst. 1163) came to the conclusion that intraspecific chromosome races are always more or less different morphologically. The available evidence of polyploidy in grasses is critically examined and the conclusion is reached that, assuming the monophyletic origin of the Gramineae, a large proportion of the species must be secondary diploids and polyploids. Information about polyploid grasses indicates that, on the whole, these tend to be adapted to a wider range of ecological conditions and show greater geographical distribution than diploids. The origin of polyploids in experiments and the physiological and morphological characteristics of experimental polyploids are examined. The evolutionary significance of polyploidy is discussed.
Monohaploids, polyhaploids and aneuploids are reported in several species.
A list of species is given in which meiosis is regular. The irregularities in other species, including autopolyploids, are described.
Over 200 interspecific and intergeneric hybrids have been reported among forage grasses, 93 of them occurring naturally, 119 being artificial or controlled and 17 both natural and controlled. An account is given of most of these hybrids.

238. Dojarenko, E. A. and Šahov, A. A. 633.2–1.524(47) 633.3–1.524(47)
(Wild forage plants of northern Kirgizia).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : Nos 7–8 : 58–67.

In 1943, the Williams Forage Institute sent an expedition to the Kirgiz S.S.R. to look for species and varieties of forage plants which could be used for improving the existing forage crops in cultivation. The expedition found, and the authors describe, the following species and their ecological and other variants: blue and yellow lucernes, *Medicago platycarpus* — (*Trigonella platycarpa*), white clover, *Onobrychis viciaefolia*, *Hedysarum* spp. *Astragalus aksuensis*, *Vicia* spp., *Orobus luteus* (especially recommended for study), *Dactylis glomerata*, *Agropyron repens* and other *Agropyron* spp., *Phleum phleoides*, *Brachypodium pinnatum*, *Bromus inermis* and annual species of *Bromus*. *A. repens* did not prove to be an arable weed in the Kirgiz S.S.R. I. Z.

239. Dojarenko, E. A. and Šahov, A. A. 633.2–1.524.4(47) 633.3–1.524.4(47)
(Some valuable wild forage plants in the basin of the river Enisei).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : No. 6 : 67–72.

The southern part of the Krasnojarsk Territory was explored in 1944 for the purpose of discovering forage plants which would provide the plant breeder with new material, or would be good enough for propagation in their existing forms. In the different vegetational regions of the territory useful specimens of *Vicia* spp., *Lathyrus* spp., *Orobus* spp., lucerne, sainfoin, clover and grasses were discovered. Some of them are described. Among them are red clovers which proved to be much hardier than many originating in more northerly latitudes. There were hardy and drought resistant yellow lucernes; perennial vetches, such as *Vicia Cracca*, which bore abundant seed and were free of pests; *Lathyrus* spp., which were valuable for their seed as well as their fodder; and a form of *Melilotus albus* reputed to contain hardly any coumarin. I. Z.

240. Hédin, L. 633.21:576.312.35:576.16
Note sur la génétique de *Poa pratensis* L. **(A note on the genetics of *P. pratensis* L.).**
Rev. Bot. Appl. 1947 : **27** : 243–44.

Information about different forms of meadow grass and the different chromosome numbers which have been recorded for the species are reviewed.
The author finds that new plants originate in the following ways: (1) haploids arise by parthenogenesis after reduction division of the egg cell; (2) diploids develop from a fertilized egg cell after reduction division of both gametes; (3) diploids are produced by parthenogenesis

without reduction division of the egg cell; and (4) triploids are formed by the fertilization of an unreduced embryo sac by a reduced pollen grain.
It is explained how individuals vary, and the conclusion is reached that variability is a genetic character.

241. NIELSEN, E. L. 633.21:581.163
Developmental sequence of embryo and endosperm in apomictic and sexual forms of *Poa pratensis*.
Bot. Gaz. 1947 : **108** : 531–34.

A study of two apomictic and two sexual plants of *P. pratensis* showed that whereas in the former the development of the embryo begins before that of the endosperm, in the latter the endosperm development is in advance of that of the zygote or proembryo during the first two days after anthesis. Five days after pollination and subsequently the comparative development of embryo and endosperm is parallel in the two types of plants.

242. EVANS, M. W. 633.24:575.42(77.1)
Varieties of timothy suited to Ohio.
Bi-m. Bull. Ohio Agric. Exp. Sta. 1946 : **31** : 136–41.

The Marietta and Lorain timothy varieties are described. In the past the Marietta variety has been composed of the three early selections, viz. F.C. 11901, F.C. 12468 and F.C. 15220, but in 1946 selections F.C. 11901, F.C. 28096 and F.C. 28185 were grown for the foundation seed. The leaves of F.C. 28096 and F.C. 28185 tend to remain green longer than those of F.C. 12468 and F.C. 15220. Marietta is suitable for growing throughout Ohio, but gives the highest hay yields in the southern part of the state. The Lorain variety originally consisted of F.C. 15167. Another selection, F.C. 28147, has been recently added, the stems of which are slightly longer than those of F.C. 15167. The Lorain variety is well adapted to conditions in northern Ohio, where it matures 10 to 12 days later than ordinary timothy and about 16 or 17 days later than Marietta.

243. 633.261:575(73)
BURTON, G. W. 633.261:576.312.35
Breeding Bermuda grass for the south-eastern United States.
J. Amer. Soc. Agron. 1947 : **39** : 551–69.

Cytological investigations at the Georgia Coastal Plain Experimental Station showed that Bermuda grass [*Cynodon Dactylon* (L.) Pers.] probably has a somatic chromosome number of 36 and several chromosome fragments. Evidence was obtained that Bermuda grass is a predominantly cross-pollinated species. Since controlled hybridization is laborious and superior plants can be propagated vegetatively on an economic scale, breeding work was carried out to produce superior clones. The breeding programme was begun with 5000 seedlings obtained by open-pollination of common, Tift and two South African Bermuda grasses interplanted in a crossing block. The seedlings showed considerable variation. The best clones obtained from this material were planted in observation plots and studied during the period 1939–46. The characteristics investigated included: rate of spread; sod density; frost resistance; disease resistance; hay yield; percentage of weeds; percentage cover; seed yield and set; interaction when grown with crimson clover and with Kobe lespedeza; resistance to root knot nematode; and longevity. The selections showed marked differences in all the characters investigated. A few superior clones from this material were compared in further experiments with regard to fertilizer requirements, chemical composition, palatability, and yield and longevity when clipped to correspond with a condition of close grazing. Selection No. 35, named Coastal Bermuda, has given outstanding results in extensive tests. It is widely adapted and generally superior to common Bermuda.

244. KREIZINGER, E. J.,
FISCHER, G. W. and 633.262–2.451.2–1.521.6(79.7)
LAW, A. G. 633.289–2.451.2–1.521.6(79.7)
Reaction of mountain brome and Canada wild-rye strains to head smut (*Ustilago bullata*).
J. Agric. Res. 1947 : **75** : 105–11.

Tests were carried out on 14 selections of *Bromus marginatus* and 12 selections of *Elymus*

canadensis to determine their reaction to 12 collections of head smut (*U. bullata*) representing physiological races 5, 7, 9 and 12. In general, *E. canadensis* proved to be more susceptible to head smut than *B. marginatus*. Selections of both species exhibited considerable differences in reaction, varying from a high degree of resistance to a high degree of susceptibility. Evidence was obtained suggesting that the physiological races used in the experiments were composed of biotypes. Accessions Wn–439 and P–3368 of *B. marginatus* showed outstanding resistance. Wn–439 is a selection made at the Washington Agricultural Experiment Station; P–3368 is a selection of Wn–439 obtained by the Soil Conservation Service at Pullman, Washington. Further investigations on the resistance of *B. marginatus* strains to head smut are being carried out.

245. Churchill, B. R. 633.262.00.14(73)
Productiveness of bromegrass strains from different regions when grown in pure stands and in mixture with alfalfa in Michigan.
J. Amer. Soc. Agron. 1947 : **39** : 750–61.

The yielding abilities under Michigan conditions of strains of *Bromus inermis* Leyss. from different seed sources in U.S.A., Canada and Russia are compared. Separate data are presented on their performance in pure stands and when mixed with alfalfa. Total yields of hay, percentage dry matter, percentage and pounds per acre of leaves and tillers, percentage protein and average yield of protein in pounds per acre, and percentage fibre in the brome grass strains are reported. The Kansas and Nebraska strains were earliest and the Russian strains latest to mature. The three most aggressive strains, judged by ability and rapidity of spreading, were Achenbach, Nebraska 10–3488 and Russian 20, and the least aggressive strains were from Michigan and Canada. The Kansas Achenbach strain produced the highest total yield of dry hay per acre. It is concluded that when testing brome grass strains in Michigan, mixing them with alfalfa is advisable, and that any change in the brome grass strain used in Michigan should probably be from the Michigan to the Achenbach or Nebraska 10–3488 strains.

246. Porter, C. L. 633.28:582(78.7)
Studies in Wyoming grasses.
Univ. Wyo. Publ. Sci. 1946 : **12** : 53–63.

The taxonomic study of grasses in Wyoming is concluded with descriptions of the Zoysieae, Phalarideae, Paniceae, Andropogoneae and Tripsaceae (cf. *Plant Breeding Abstracts*, Vol. XV, Absts 1027, 1028); brief reference is made to the economic value of the genera.

247. Karper, R. E. and Quinby, J. R. 633.282:581.148:575.113
The inheritance of callus formation and seed shedding in sorghum.
J. Hered. 1947 : **38** : 211–14.

A study of the progeny of crosses between Tunis grass (*Sorghum virgatum*) and other grass sorghums showed that seed shedding caused by callus formation below the seed is controlled by two dominant genes. These have not been located on the chromosomes but it was noticed that neither of them is linked with *q*, the gene for black-purple plant colour or with *p*, the gene for tan plant colour. Since Sh_1 has been assigned to a gene producing non-shedding in the dominant condition, the two genes reported here are designated Sh_2 and Sh_3. It is thought possible that one of them may prove to be identical with Sh_1 in spite of the reversal in dominance.

248. Nielsen, E. L. 633.283–2.111–1.521.6:576.356.5
Polyploidy and winter survival in *Panicum virgatum* L.
J. Amer. Soc. Agron. 1947 : **39** : 822–27.

The general aspects of the problem of polyploidy in relation to environment are discussed. Observations are reported on the winter survival of 40 lines of *P. virgatum* of which the chromosome numbers are given and of 23 lines of unknown chromosome numbers. The data suggest that polyploidy is not directly associated with winter hardiness or with the

ability of polyploids to grow in a more rigorous environment that the corresponding diploids.

249. Louis-Marie, P. 633.286:582(71)
Les variations arctiques du *Trisetum spicatum* (L.) Richt. [**The Arctic variations of *T. spicatum* (L.) Richt.**].
Ann. Ass. Canad. Fr. Advanc. Sci. Montréal **1941** : **7** : p. 98.
It is reported that Polunin in his recent Arctic flora records five varieties of *T. spicatum*, between some of which there are intermediate types.

250. Louis-Marie, P. 633.286:582:576.16
Type générique et types spécifiques de *Trisetum*. (**Generic and specific types in *Trisetum***).
Ann. Ass. Canad. Fr. Advanc. Sci. Montréal **1943** : **9** : p. 108.
In this paper, a phylogenetic treatment is reported of the American species of *Trisetum*.

LEGUMINOUS FORAGE PLANTS 633.3

251. Klinkowski, M. and 633.3–2.483–1.521.6
Richter, H. 635.65–2.483–1.521.6
Untersuchungen über den Wirtspflanzenkreis von *Colletotrichum trifolii* Bain et Essary. (**Investigations regarding the range of host plants of *Colletotrichum trifolii* Bain et Essary**).
Festschrift zur Feier des achtzigsten Geburtstages von Otto Appel Berlin-Dahlem **1947** : 56–58.
From infection tests carried out in the field, species of the genera *Lupinus, Trigonella, Hosackia, Anthyllis, Lotus, Galega, Cornella, Onobrychis, Vicia, Cicer, Lens* and *Lathyrus* were found susceptible to *C. Trifolii* Bain et Essary. *Trifolium repens* and *Pisum sativum* showed leaf spots and so were classed as only relatively resistant, instead of resistant as stated by Monteith and Sampson. White clover and soya bean plants, though showing leaf spots, did not die as did the other susceptible forms tested; soya bean showed more leaf spots than either of the other two. The Old World forms of lupin proved resistant, whilst the New World forms were attacked. The species *Vicia sativa* was susceptible but *V. angustifolius* was resistant. E. W.

252. Böning, K. 633.3–2.484–1.521.6(43)
Die durch *Thielavia basicola* Zopf hervorgerufene Wurzelbräune des Klees, ihre Abhängigkeit von Umweltfaktoren und ihre Beziehung zu Unverträglichkeitserscheinungen der Leguminosen. (**Black root rot in clover due to *Th. basicola* Zopf and its dependence on surrouding conditions and its relation to intolerance phenomena of the Leguminosae**).
Festschrift zur Feier des achtzigsten Geburtstages von Otto Appel Berlin-Dahlem **1947** : 60–63.
Black root rot occurred in descending order of severity in the following species of *Trifolium*—white clover, alsike, red clover, crimson clover. Blue lupin and dwarf bean were very severely attacked by the fungus, yellow lupin and soya bean rather less severely.
Experiments on Leguminosae with different strains of *Th. basicola* seemed to show that there was no pronounced specialization of biological forms as regards virulence towards legumes. Four strains of *Th. basicola* from Baarn, Gilbert, Johnson, Tiddens I and III, and two strains from Dahlem, R 13 (from *Lupinus albus*) and R 51 (from tobacco) were studied. Results showed that blue lupins, white clover and dwarf bean were the most severely attacked by all these strains, then came alsike and finally lucerne: dwarf bean was not attacked by any of these strains; yellow lupin was severely attacked by Johnson, R 13 and Tiddens III, slightly less severely by Gilbert and R 51 and not at all by Tiddens I; red clover was immune to R 51 and Tiddens I and III. Confirmation of these results is necessary to make sure that tolerance effects were not present. E. W.

253. TYSDAL, H. M. 633.31:575(71 + 73)
Report of the Uniform Alfalfa Nurseries.
U.S. Dep. Agric., Agric. Res. Admin. Bur. Pl. Industr. Soils and Agric. Engin. Beltsville, Maryland 1945 : Pp. 38. (Mimeographed).

The ninth annual report of the Uniform Alfalfa Nurseries presents the results of variety and strain tests for the 1945 crop year. Data were received from seven state experiment stations, the nursery of the United States Department of Agriculture, Beltsville, Maryland, and the Dominion Forage Crops Laboratory at Saskatoon, Canada. The nurseries are at a transitional stage between the former plan of testing varieties and strains and the new polycross testing. Reports are given of nursery tests of hay yields in Canada, Minnesota, Ohio and Oklahoma. Data on hay and seed yields in nursery tests are reported from Ohio, Utah and Washington. Observations on disease were received from Oklahoma and Wisconsin. Polycross progeny plantings sown in 1944 in Canada, Maryland and Ohio have provided data on the hay yields, winter injury, stand survival and other aspects of the performance of polycross, synthetic and hybrid strains.

Lists are included of the new strains entered into the co-operative testing programme under A and C numbers since the previous report (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 1289), giving notes on the origin of the strains; the lists cover strains A 201–220 and C 88–C 161.

Supplements to the ninth annual report have also been issued giving complete lists of the A 1–A 220 and C 1–C 161 strains which have been included in the co-operative tests since they were begun.

254. 633.31:575(73 + 71)
TYSDAL, H. M. 633.31–1.531.12(73 + 71)
Report of the Tenth Alfalfa Improvement Conference, August 7–9, 1946, Utah : Pp. 66. (Mimeographed).

Abstracts are given of the regional reports of progress and objectives presented at the Tenth Alfalfa Improvement Conference by representatives of the American States and Canadian Provinces participating in the co-ordinated lucerne breeding programme. Many of the investigations reported are dealt with in the separate annual reports of the various research stations concerned.

The report also includes summaries of addresses on the position of the seed trade; the improvement of quality in lucerne and lucerne hay; the hastening of the process of varietal evaluation by the imposition of various adverse conditions; disease problems in seed-producing areas; the seed production of improved varieties; and the use of bees for pollination. A summary is also given of the round table discussion of plans for co-operative basic research in relation to the production of lucerne seed.

255. 633.31:575.42(73)
633.31–1.531.12(73)
New Williamsburg alfalfa strain for south flies west to grow up in dry Utah sunshine.
Sth. Seedsman 1947 : **10** : No. 9 : p. 28.

The Williamsburg lucerne strain has been selected from Kansas Common at the Eastern State Experiment Station, near Williamsburg, Virginia. The 17,000 seedlings produced at this station were recently sent by airliner to Utah, for seed production. Seed of the strain will be supplied to farmers in Virginia in quantity in 1950. The Williamsburg strain is hardy, and is slightly less susceptible to disease than the parent variety. The recovery of the top growth is more rapid than in Kansas Common, an advantageous character where the crop is in competition with weeds.

256. LINSLEY, E. G. and MACSWAIN, J. W. 633.31:581.162.3
Factors influencing the effectiveness of insect pollinators of alfalfa in California.
J. Econ. Ent. 1947 : **40** : 349–57.

Data and observations are presented concerning the effects of physical and biotic factors in the environment and of the physiological characters of the insects themselves on the

effectiveness of alfalfa pollinators. It is concluded that maximum alfalfa seed production in California appears to depend upon the pollinating activity of honey bees and many wild bees. The increasing of the number of honey bees, experiments to encourage wild bee populations and the elimination of plants which provide competing pollen sources in seed production areas are recommended.

257. Linsley, E. G. and MacSwain, J. W. 633.31:581.162.3
The effects of DDT and certain other insecticides on alfalfa pollinators.
J. Econ. Ent. 1947 : **40** : 358–63.

The effects of dusting alfalfa with DDT, used for lygus bug control, on the visits of bees and their subsequent mortality, are examined. More work will be necessary to determine whether its use on plants in bloom kills enough bees to decrease tripping and cross-pollination.

258. Covas, G. and Fernández, O. 633.31:581.162.32(82)
Cruzamientos naturales y artificiales en alfalfa. (**Natural and artificial crossings in lucerne**).
Rev. Argent. Agron. 1947 : **14** : 70–72.

Data are given on the degree of outcrossing that occurs in different strains of lucerne under various environmental conditions at Mendoza, Argentina.

259. Wilson, M. C. (Jun.) 633.31–2.3–1.521.6:575.11
Inheritance of resistance in alfalfa to bacterial wilt.
J. Amer. Soc. Agron. 1947 : **39** : 570–83.

The inheritance of resistance in lucerne to bacterial wilt caused by *Corynebacterium insidiosum* (McCull.) Jensen was investigated in the selfed progeny of resistant plants, mostly derived from Turkestan lucerne, the F_1, F_2 and F_3 generations of crosses between the resistant plants and the susceptible California Common variety, and back-crosses of F_1 plants to California Common. The data obtained suggest that resistance to bacterial wilt depends on several genes. The action of three genes, designated *R*, *T* and *P*, and possibly of a fourth separate gene designated *T'*, had been analysed. These genes are all partially dominant, and *R* and *T* are supplementary. The factor *P* gives the strongest expression of resistance, and it should prove useful in breeding for wilt resistance. Plants homozygous for *P* show 72% healthy plants. The factor *R* is intermediate in its expression of resistance, while *T* and *T'* are both weak.

260. Trofimova, A. N. 633.31.00.14:632.111(47)
(**Lucerne in the non-black soil zone**).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946) : **13**: No. 6 : 72–74.

The results of survival tests carried out at Zugovaja on local and foreign varieties of lucerne are recorded and discussed.

261. Bateman, A. J. 633.32:581.162.5:575.11
Number of *S* alleles in a population.
Nature, Lond. 1947 : **160** : p. 337.

The number and frequency of *S* allelomorphs in samples of two self-incompatible clover varieties (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1425) are discussed.

262. 633.32–1.531.12(48.9)
Christensen, N. A. 633.2–1.531.12(48.9)
Foreløbig Meddelelse om Forsøg vedrørende Avl af Kløver- og Graesfro.
(**Preliminary communication on experiments relating to the raising of clover and grass seed**).
Beretn. Planteavl. Lolland-Falster 1939 (1940) : 126–33.

The experiments dealt mainly with methods of seed raising but included some observations on the yield of seed from Danish clover strains. The differences observed need, however, to be confirmed by experimentation for a series of years.

263. 633.321–2.111:575.42
ZVEZDKINA, A. S. 633.321–2.112:575.42
(Methods of breeding perennial forage crops in the province of Irkutsk).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : Nos. 7–8 : 50–57.

The climate of Irkutsk requires drought-resistant, hardy plants which mature soon enough to avoid the treacherous autumns with their absence of snow, and alternating periods of cold and warmth. Accordingly, 2000 specimens of forage plants were collected in the province and elsewhere. They included many wild plants, particularly those of red clover, which is the main concern of the present article. For the wild plants, a method of mass and individual selection among the best ecological types was devised in order to save time. The selected types were then subjected to further modification and improvement by means of cultivation in a favourable environment, and especially by a modified system of unrestricted pollination. Tests of drought and cold resistance were devised for the selected and improved plants, among which two varieties of red clover were found to be promising, and are described. I. Z.

264. STEWART, E. H. and
ROGERS, H. T. 633.326–2.421.1–1.521.6(76.1)
Adaptability of strains of subclover to Alabama conditions.
J. Amer. Soc. Agron. 1947 : **39** : 830–31.

An account is given of the reseeding ability, comparative earliness and mildew resistance of four strains of subterranean clover, *Trifolium subterraneum* L. in plantings on Susquehanna clay in Alabama.

265. ROY, K. B. 633.327:575.42(76.1)
This clover conquered Bermuda grass.
Sth. Seedsman 1947 : **10** : No. 9 : p. 15.

Foundation seed of the Auburn Reseeding Crimson Clover is to be released by the Alabama Agricultural Experiment Station. The strain has been selected from a volunteering strain of crimson clover of unknown origin; it has invariably produced thick volunteer stands in extensive tests.

266. WILSIE, C. P. and
HUGHES, H. D. 633.364:575.42(77.7)
Development of early maturing wilt-resistant strains of Korean lespedeza.
J. Amer. Soc. Agron. 1947 : **39** : 615–22.

The work of developing early maturing, bacterial wilt resistant strains of Korean lespedeza (*Lespedeza stipulacea*) in Iowa is described. As a result of these investigations three wilt resistant strains are being released, viz. Iowa 6, Iowa 39 and Iowa 48. Iowa 6 is vigorous and early in maturity. Iowa 39 is somewhat less vigorous and slightly later in maturity than Iowa 6; it has a characteristic greyish green colour, and the unusual ability to grow on soils with a high lime content. Iowa 48 is one of the most vigorous and productive of all the strains tested; it is a little later in maturity than the other two strains, but earlier than the standard Korean lespedeza.

267. SLATENSEK, J. M. 633.366:581.192:578.08
Some causes for variation of coumarin content in sweetclover.
J. Amer. Soc. Agron. 1947 : **39** : 596–605.

Experiments on the causes of non-heritable fluctuation in coumarin content in sweet clover were carried out, with a view to obtaining information useful for developing satisfactory sampling techniques in breeding for low coumarin content. The analyses of coumarin content were made on a dry weight basis, by means of the fluorometric method, and the results obtained were checked by means of the colorimetric test. The fluorometric technique used is described in detail. The following aspects of coumarin fluctuation were investigated: seasonal variation; the distribution of the coumarin in various parts of the plant; the effect of light intensity and nitrogen fertilizer; the relationship between the coumarin

contents of the first and second year's growth; the extent to which the coumarin content is transmitted from the parent plant to its progeny; and the relationship between coumarin content and plant vigour. Statistically significant positive correlations were found to exist between the coumarin contents of the first and second year's growth, and between the coumarin contents of inbred parent plants and those of their progenies. A low significant negative correlation was obtained between plant vigour and coumarin content.

268. JACKOBS, J. A. 633.366–2.411.4–1.521.6

Factors affecting seed rotting caused by *Pythium* spp. in sweet-clover with preliminary tests in alfalfa and red clover.

J. Amer. Soc. Agron. 1947 : **39** : 702–18.

Experiments were carried out to investigate the effect of various factors upon seed rotting in *Melilotus*, lucerne and red clover, caused mainly by *Pythium* spp.

Inherent differences were found among plants in the amount of seed rotting observed in their progenies, in an experiment carried out on *M. officinalis*. It is suggested that these genetical differences were probably due to the influence of certain characters of the mature plant upon seed development, rather than to genetic factors for resistance or susceptibility to *Pythium* in the germinating seed.

269. *FEDOTOV, V. S. 633.367:581.6:575(47)
633.367:575.127.2

(Modern problems and methods of breeding lupin).

Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : Nos 7–8 : 40–49.

Reference is made to the great extension of lupin cultivation in the Soviet Union since the discovery of the sweet lupin and to the new problems that this has introduced in lupin breeding. It is mentioned that in studying a certain lupin population from Belorussia well over 400,000 plants were examined before one alkaloid-free one was found.

Owing to the recent introduction of lupin cultivation there are no local land races and improved material will naturally play a greater part than in breeding cereals. Furthermore the difference between cultivated and wild forms is not so great and wild forms will be more important for breeding purposes than are the wild cereals. A study of wild Portuguese lupins has revealed the presence of forms resistant to mildew and other diseases.

A simplified method of testing alkaloid content is described.

Alkaloid content is a hereditary character but is very much influenced also by environmental conditions. Thus, in experiments in 1932, the alkaloid content of the seed was 0·3% when the lupins were grown on good sandy soil well manured, and 1·8% on podzolized sandy soil without manure. Low humidity also increases the alkaloid content, whereas all factors tending to increase seed yield reduce alkaloid content. Some tendency for sweet lupins to revert to bitter gradually after a certain number of generations has been observed; for example the sweet variety Pioneer in 1933 contained 0·049% alkaloid in the dried seed, 0·060% in 1934, 0·085% in 1935 and 0·169% in 1936. This change is ascribed to the fact that the yellow lupin cross-pollinates easily and the sweet forms can be quickly contaminated with bitter forms, particularly in view of the somewhat lower viability of the sweet form, which is more subject to attack by pests and diseases. The proportion of bitter plants in the fourth generation in 1936 was found to be 11%, as against only 1% in 1933. By effecting careful selection for low alkaloid content this reversion can be prevented. The sweet lupin tends to be overwhelmed with weeds owing to its slow growth in the early stages. More rapidly growing forms have however been found. The discovery of winter and semi-winter forms in Portugal suggests the possibility of extending the cultivation of yellow lupin into the subtropical zone.

Experiments to test the amount of cross-pollination in yellow lupin have shown that 30% cross-fertilized seed results from open-pollination; no loss of vigour resulted however from 5–6 generations of selfing by bagging. In breeding work with sweet lupins, it is important to keep every family isolated, since it has been shown that bitter forms may arise even from

* An extended summary of this paper is on file at the Bureau.

crosses of two sweet forms. Every generation moreover must be tested for alkaloid freedom, and all bitter forms removed before flowering. If possible only families containing no bitter plants should be retained. A sample of 100–200 seeds is taken from each family for this purpose. Final selection is made also according to the lowest average alkaloid percentage.

Lupinus angustifolius is distinguished by slightly more rapid early growth and grows well on a variety of soils in addition to sandy soils; it also ripens earlier and is more suitable for northern conditions than the yellow lupin, which surpasses it however in protein content. The sweet forms are unfortunately extremely susceptible to diseases such as *Fusarium*, mildew and bacterial infection, and from insects such as aphids and *Bothynoderes*. A greater range of wild forms should be studied for breeding purposes, since there are indications that some of the wild forms are more disease resistant. Breeding work with bitter forms should in the meantime not be abolished. Since this species is strictly self-pollinated, no special precautions against contamination are necessary.

L. albus gives exceedingly high yields of seed, which at times have exceeded 50 c. per ha. Its cultivation in northerly districts is limited by the excessively long period from flowering to ripening, and there is scope for breeding more rapidly maturing forms. Many drought resistant forms exist and are promising for the arid regions of the Altai and Siberia. Some forms have an oil content of up to 14% in the seed and this could probably be increased still further by breeding. The species is self-pollinated and offers no special difficulties for breeding.

L. mutabilis has up to 21·3% of oil in the seeds but the yield is low owing to the tendency of the flowers to shed, and this, together with other defects such as late maturity, will have to be overcome before the species can be used in cultivation. Similarly *L. perennis* is difficult to use because of its seed shedding and extended period of ripening. Both the last two species are partially cross-pollinated.

Every species has certain virtues and certain defects, and the ideal combination could probably only be achieved by interspecific hybridization. The only hybrids that have so far been made successfully are those between species of the 24 chromosome group, such as *L. mutabilis* x *L. pubescens* and *L. mutabilis* x *L. varius*. The hybrids are intermediate in their characteristics, with a tendency for the features of the small-seeded species, *L. pubescens* and *L. varius*, to predominate. The first generation is partially sterile, but fertility increases gradually in succeeding generations. Segregation is complicated and many intermediate types occur, but it is difficult to get them to breed true. Spontaneous hybrids of *L. mutabilis* x *L. varius* behave in the same way.

So far the only hybrid between species of different chromosome number obtained is *L. luteus* ($n = 26$) x *L. angustifolius* ($n = 20$), but the plants are entirely sterile.

270. CARSON, C. M. 633.372(73)
Stock-safe *Crotalaria*.
Sth. Seedsman **1947** : **10** : No. 8 : **13**, 42.

Crotalaria spectabilis, the chief species now cultivated in the southern United States, may shortly be supplanted by the African species, *C. intermedia* and *C. lanceolata*. These two species have the advantage of non-toxicity to livestock.

ROOTS AND TUBERS 633.4

271. 633.41:575.42(48.1)
LINLAND, D. 633.491:575(48.1)
Forsøk med rotvokstrar. (**Root crop trials**).
Meld. Stat. Forsøks. Forus 1938–1939 (1940) : H18–H70.
Meld. Stat. Forsøksstasjoner Plantekult. 1939 (1941).

Detailed reports are given of trials of turnips, swedes, beets and potatoes.

As in previous trials, the Norwegian turnip Hvit Mai [White May] ranked first. The best variety of swede was Bangholm Austråt, and the best fodder beet was the Danish strain of Barres, Strynø VII.

The Norwegian strain of Barres, Tjore, has a higher percentage dry matter but averages a slightly lower weight of roots and much less nutritious top. The sugar mangel Korsager

VII could not compete with the fodder beets. The new potato, Pari, from the Forus Experimental Farm, is almost immune to "dry rot on the haulms" and has heavy large tubers, while the dry matter percentage is higher than for any available Norwegian variety of potato; but it is a late type. The author has therefore crossed Pari with another new Forus variety, Venus, to try to obtain an earlier potato of the Pari type.
In addition to observations on yield and chemical composition the occurrence of bolting was also recorded in the beet studies.

272. GINNEKEN, P. J. H. VAN 633.41:581.192:519.24
De allometrische wet. Toepassing en uitbreiding. (**The allometric law. Application and extension**).
Meded. Inst. Rationeele Suikerprod. Bergen op Zoom 1947 : No. 5 : 153–299.
Among the applications whose validity is here examined, is the application of allometry to the relation between sugar content and root weight in beets.

273. 633.416.00.14(48.1)
ELLE, TH. 633.426.00.14(48.1)
Forsøk med sorter og stammer av kålrot og fôrbete 1934–39. (**Trials with varieties and strains of swedes and fodder beets, 1934–39**).
Meld. Stat. Forsøks. Møistad 1939 (1940): H25–H38.
Meld. Stat. Forsøksstasjoner Plantekult. 1939 (1941).
The performance of some Danish, Swedish and Norwegian varieties in trials in Norway is recorded. Some results with turnips are also given.
The Göta swede (Algot Holmbergs Original) is mentioned as having shown a tendency to crack, with different effects depending on the stage at which the defect occurs.

274. 633.416.0014(48.9)
633.63.0014(48.9)
RASMUSSEN, K. L. 633.491.0014(48.9)
Beretning om Sorts- og Stammeforsøg. Udført under Ledelse af de provinsielle Planteavlsudvalgs Sorts- og Stammeudvalg. (**Report on trials of varieties and strains, conducted by the Provincial Variety and Strain Committee of the Committee for Plant Cultivation**).
Beretn. Planleavl. Lolland-Falster 1939 (1940) : 110–25.
Full details are given of trials of strains of fodder beets, sugar beets, sugar mangels and swedes sent in for testing in 1939 by private firms and other concerns in Denmark.
Similar information is given for spring and winter wheats and table potatoes (two varieties only), tested in various parts of Denmark by the Variety and Strain Committee.

275. SUN, P. C. 633.42:582
(**Evaluation of the taxonomic characters and the system of classification of the genus *Brassica***).
J. Agric. Ass. China 1945 : Suppl. No. 50 : 11–12. (Abst. 25th Annu. Mtg).
The taxonomy of the genus *Brassica* is examined. It is proposed to classify the genus into the following seven species: *B. nigra* Koch., *B. carinata* Braun, *B. oleracea* L., *B. Napus* L., *B. campestris* L., *B. chinensis* L. and *B. juncea* Coss.
The author disagrees with the proposal to combine the genera *Sinapis* and *Brassica*. *S. alba* is said to be distinguished from species of *Brassica* in the following respects: (1) its haploid chromosome number of $n = 12$, and large pollen grains; (2) the size and shape of its siliqua; (3) the number of seeds per siliqua; (4) the length of the broad flat beak of the siliqua; (5) the presence of tough hairs on the plants and siliqua; and (6) longitudinal grooves on the stem.
It is suggested that *B. pekinensis* Rupr. should be regarded as a variety of *B. chinensis*. It is pointed out that the F_1 hybrids between *B. pekinensis* and *B. chinensis* var. *pandurata* (L.) Sun. show no hybrid vigour, and that the two species have similar reproductive organs. Both *B. campestris* var. *oleifera* (L.) Metz. and *B. chinensis* var. *pandurata* have a haploid

chromosome number of $n = 10$, but great differences exist between the two species; the author points out that the turnip varieties of Europe do not occur in China, but that on the other hand a number of *Brassica* vegetables of the same chromosome number ($n = 10$) common in China are unknown in Europe. The author believes that there are two geographical centres of origin of *Brassica*, an oriental centre represented by *B. chinensis*, and an occidental one represented by *B. campestris*.

276. 633.42–2.411.4–1.521.6
FOSTER, H. H. 635.3–2.411.4–1.521.6
Reaction of species and varieties of Cruciferae to artificial inoculation of cabbage downy mildew.
Phytopathology 1947 : **37** : p. 433. (Abst.).

A summary is given of the results of three years' tests on approximately 100 commercial varieties of economic cruciferous species for resistance to *Peronospora parasitica*.

277. 633.42.0014(48.1)
EIKELAND, H. J. 633.426.0014(48.1)
Forsøk med nepe og kålrot. (**Trials with turnips and swedes**).
Meld. Stat. Forsøksgard Voll. 1938 (1939) : **27** : H8–H74.
Meld. Stat. Forsøksstasjoner Plantecult. 1938 (1940).
Tillegg H till Landbruksdirektørens årsmelding 1938.

This report includes all variety trials and also storage and other experiments with turnips and swedes from 1923 to 1938 inclusive. Norwegian, Danish and Svalöf varieties and strains and also some from Fünen were used and analyses of dry matter content, etc., were regularly made.

278. 633.42.0014(48.1)
FLOVIK, K. 633.42:581.143.26:581.6
Forsøk med nepe. (**Trials with turnips**).
Meld. Stat. Forsøks. Holt 1940 (1941) : H61–H115.
Meld. Stat. Forsøksstasjoner Plantekult. 1940 (1942).

Well known Danish, Swedish, Norwegian, and Finnish varieties of turnips were included in these tests, in which bolting, effects of length of day, yields and food value, effects of thinning, and planting methods, were studied.
The experiments and results are fully discussed and a useful bibliography of relevant Norwegian and other references is appended.

279. 633.42.0014(48.1)
SLØGEDAL, H. 633.426.0014(48.1)
Sortsforsøk med rotvokstrar. (**Variety trials with root crops**).
Meld. Stat. Forsøksgård Vågønes 1938 (1939) : H20–H86.
Meld. Stat. Forsøksstasjoner Planticult. 1938 (1940).
Tillegg H till Landbruksdirektørens årsmelding 1938.

Trials conducted from 1930–38 with turnips and swedes from Norway and Denmark, including Fünen, are recorded in detail, with incidental notes on bolting, and chemical composition in different varieties.

280. 633.491:575(48.1)
ELLE, TH. 633.491.0014(48.1)
En oversikt over potetdyrkingens stilling og betydning, bygd på 35 års forskjellige potetforsøk ved forsøksgården Møistad. (**A survey of the present position and importance of potato growing, based on 35 years of different potato experiments at the Møistad Experimental Farm**).
Meld. Stat. Forsøks. Møistad 1940 (1941) : H42–H85.
Meld. Stat. Forsøksstasjoner Plantekult. 1940 (1942).

There are large numbers of varieties of potatoes in Norway. They show great variation and a wide range of uses and distribution, and may be grouped according to (1) growing time and (2) requirements for table, industrial or fodder purposes. Earliness is very important for certain districts and may also be a factor in disease resistance.

Descriptions are given of the following varieties, grown in Norway, with notes on their origin and their suitability for various uses: General Cronje, Parnassia, Alpha, Richters Jubel, Hellena, Arnica, Ås Marius and Louis Botha, Kerr's Pink, and new hybrid selections from nine hybrids produced by A. Lunden that have undergone field experiments at the Norwegian Agricultural College [Landbruks-høgskolen]. The parentage of the new hydrid varieties is given with detailed notes of their yield, dry matter and starch content, and disease resistance. The five varieties, which have not yet been finally named, are called S x R.J. plant 208 (from Sagerud x Richters Jubel); L.B. x R.J. 52 (a Louis Botha x Jubel cross); K.P. x R.J. plant 240 (from Kerr's Pink x Jubel); K.P. x R.J. plant 59; and L.B. × R.J. 305. Further trials will be made with these selections.

281. 633.491:575(48.1)
633.491.0014(48.1)

Foss, H.
Forsøk med poteter 1935–1940. (**Experiments with potatoes 1935–40**).
Meld. Stat. Forsøks. Løken 1940 (1942) : H3–H78.
Meld. Stat. Forsøksstasjoner Plantekult. 1940 (1942).

Detailed results are presented of trials held at Løken (Norway) during the six years in question and on 53 different experimental plots in the mountain district. The varieties tested included: Sagerud Grahm (Up-to-date), British Queen, Kerr's Pink, Gullkrone [Yellow Crown], Jubel (Richters), Kong Georg [King George], Marius, Ås, and Dukker.
Sagerud was outstanding in the trials at Løken and the higher localities elsewhere, in regard to quality and yield of dry matter; it is also early and therefore most reliable for high altitudes. Not being very resistant to blight it is difficult to use in the lower lying parts.
Gullkrone is a new variety which has been tested at Løken only. Its yield is about the same as that of Sagerud, with a slightly lower dry matter percentage and yield of dry matter; the tubers are very well shaped and of good quality; the variety is late and no more resistant to blight than Sagerud.
Ås is a late variety with well-shaped tubers of good flavour and a high blight resistance which enables it to be grown anywhere.
Marius is also resistant to blight and has good table qualities.
Other subjects of investigation were experiments on germination methods (including pre-germination of seed potatoes), time of lifting and manuring. In recent years Vigerust made some crosses to combine high dry matter, and the fine table quality of Sagerud with the greater resistance to blight of Jubel and similar varieties, but the results are not yet far enough advanced for discussion.
In 1936 the Norwegian Agricultural College sent 20 new hybrids (produced by Dr. Lunden) to the Løken Experimental Station. All but three of these have gradually been eliminated and the three have surpassed Sagerud in yield and almost equalled it in percentage dry matter. The work is proceeding.

282. 633.491:575(73)

Developments in potato breeding.
Amer. Potato J. 1947 : **24** : 220–31.

The article summarizes talks given at the meeting of the Potato Association of America, held at Chicago in December, 1946. The subjects of the talks included early potato breeding investigations in the United States, the general aims of the National Potato Breeding Programme, breeding for resistance to common scab and blight, and the problems connected with varietal introduction and testing.

283. 633.491:575.74:631.531.12(43)
633.491–2.8–1.521.6(43)

Störmer, K. and Bernuth, I. von
Zur Bekämpfung der virösen Abbaukrankheiten der Kartoffel. (**Protective measures against the virus diseases causing degeneration in the potato**).
Festschrift zur Feier des achtzigsten Geburtstages von Otto Appel, Berlin-Dahlem 1947 : 27–29.

Infection causing leaf roll appears to be rarer in regions of high altitude. In 1945 and 1946

near Göttingen, where leaf roll was prevalent, the land at 270 m. and higher was perfectly healthy and in certain parts of Central Germany, where degeneration is rife, sound seed potatoes can be grown in mountain districts.
Köhler's method of testing sprouted eyes should be part of the tests for approving seed potatoes.
The questions arise whether, apart from the known varieties which are latent virus carriers, there are in each variety, not belonging to the latent carriers, virus carrying individuals without symptoms of disease—and whether the daughter tubers from these are infected or not. On these questions research is necessary. Some virus diseases, such as the so-called light mosaic due to X or A virus, appear more marked in the early development of the potato and later seem to disappear more or less, but even where apparent decline of disease has occurred the plants once infected remain so. Other diseases, e.g. leaf roll, occur at a later stage and persist.
A prime aim of all breeders and producers of seed potatoes must be virus-free seedlings which no longer give virus disease reaction even on the border strip. E. W.

284. Silberschmidt, K. 633.491:578.08:575.74
O valor diagnóstico de alterações das qualidades fisiológicas dos tubérculos para o reconhecimento do grau de degenerescência das batatinhas. (**The diagnostic value of the alterations in the physiological qualities of the tubers for the recognition of the degree of degeneration of potatoes**).
Ceres, Brasil 1944 : **5** : 326–51.
The various techniques proposed for estimating the degree of degeneration of potato tubers are reviewed.

285. 633.491:581.05(67.61)
Moreau, R. E. 633.491:581.02(67.61)
Les variétés de pommes de terre de l'Est africain et leur relation avec le climat. (**The potato varieties of East Africa and their relation to climate**).
Bull. Agric. Congo Belge 1946 : **37** : p. 659.
A summary in French is presented of an earlier paper by Moreau already reviewed (cf. *Plant Breeding Abstracts*, Vol. XIV, Absts 725 and 1080).

286. Blodgett, E. C. and 633.491:581.143.32
Nielsen, L. W.
Fasciation in Russet Burbank potatoes.
Phytopathology 1947 : **37** : 597–600.
A fasciated condition of the tubers and plants of the Russet Burbank potato is reported, which appears to be genetic in origin.

287. 633.491:581.143.32:575
Müller, K. O. 633.491:581.142:575
Über die Knöllchensucht der Kartoffel und eine weitere Keimungsanomalie der Kartoffelknolle. (**"Small tuber" disease of the potato and another anomaly, also of germination, of the potato tuber**).
Festschrift zur Feier des achtzigsten Geburtstages von Otto Appel, Berlin-Dahlem 1947 : 37–39.
In this rather rare disease the tubers show no external symptoms but develop stolon-like plagiotropic shoots which grow into small daughter tubers. Too prolonged winter storing is one accepted cause of the disease, and repeated successive germinations of the plant tubers is said to promote it. The German varieties Deodara and Sickingen, grown intensively in 1930, were highly susceptible; Eersteling [= Duke of York] was less so.
The author's work shows that the tendency to "small tuber" disease is a varietal character and one which is transmitted to the sexual progeny. Thus the disease is due to certain genetic factors, but its severity depends on the presence of certain external factors. Ripening during drought seems to promote the disease, but the physiological age of the tubers

when the drought occurs is also significant, as is shown by the fact that tubers of a given plant can react differently.
From the observed relation between too prolonged storage of the varieties Deodara and Sickingen and their proneness to "small tuber" disease the author has devised a test for susceptibility of new varieties to this disease.
Another anomaly of germination, viz. development of flowers on young shoots of tubers, was noted in a pedigree strain from the so-called varieties, after excessive storage in cold chambers in darkness and subsequent transference to a warm half-darkened cellar; the tuber shoots grew flowers without previous full development of the incipient foliage leaves. Some other pedigree strains similarly treated showed no such anomalous germination. The author regards this as probably another kind of idiotypically conditioned anomaly of development, but again also governed by external factors.
The physiological causes of these abnormal formations of tiny tubers and flowers has not yet been discovered. A suggestion is made that there might be tuber-forming hormones similar to the flower-forming hormones. E. W.

288. WIERSEMA, H. T. 633.491:581.162.5
Het probleem van de steriliteit bij de aardappel. (**The problem of sterility in potatoes**).
Meded. N.A.K. 1944 : **1** : 21–23.
A very full description of the phenomenon of sterility, which ranges from complete sterility to high fertility, is given. Setting of berries is greatly influenced by length of day (16 hours is optimum for the development of flowers) and by weather. Cool and damp weather without too much rain is best, preferably with 3 or 4 days when evaporation is slight before pollination. Little is known regarding the best nutritional status for seed setting, but excessive nitrogen is to be avoided.
Methods of inducing flowering (by ringing, removal of tubers, grafting on tomatoes, etc.) are discussed in detail, and the success of such methods is ascribed to an increase in the content of hormones. C. B.

289. 633.491:581.162.5:575.11
PUSHKARNATH 633.491:575.127.2
Studies on sterility in potatoes. III. Incompatibility allelomorphs.
Indian J. Genet. Pl. Breed. 1945 : **5** : 92–105.
Crosses involving the use of *Solanum subtilius*, *S. Caldasii*, *S. chacoense* and *S. jujuyense* were analysed with regard to their constitution of *S* allelomorphs controlling self and cross incompatibility. The following four F_1 families were tested: D–29 (*S. Caldasii* var. 1 x *S. Caldasii* var. 07): D–34 (reciprocal of first named cross); C–115 (*S. Caldasii* var. 01 x *S. jujuyense*); and C–108 (*S. chacoense* var. 07 x *S. subtilius* var V_1). Previous investigations by the author (cf. *Plant Breeding Abstracts*, Vol. XIII, Abst. 403) revealed the presence of five *S* allelomorphs in three of the varieties, as follows: *S. subtilius* var. V_1, S_1S_3; *S. Caldasii* var. 01, S_1S_5; and *S. Caldasii* var. 07, S_2S_4. Further experiments have established the presence of six new *S* allelomorphs, the constitution of *S. Caldasii* var. 1, *S. jujuyense* and *S. chacoense* var. 07 being S_6S_7, S_8S_9 and $S_{10}S_{11}$, respectively. The cross and self incompatibility relationships in the four species studied can be explained on the basis of simple oppositional interaction. It has also been found that *S. Aracc-papa* and *S. Rybinii* possess some factors of the same series of *S* allelomorphs; these species are cross-compatible with *S. subtilius*, of the genotype S_1S_3, and several other testers, but the results obtained cannot be explained on the basis of the behaviour of simple oppositional allelomorphs. A further detailed study of *S. Aracc-papa* and *S. Rybinii* is therefore being carried out.

290. FINEMAN, Z. M. 633.491:581.162.51
Elimination and retention of pollen sterility in potato improvement.
J. Agric. Res. 1947 : **75** : 135–45.
It is pointed out that while pollen fertility is necessary for breeding work, pollen sterility increases the yield of potatoes. A study of the progeny of five sets of reciprocal crosses

showed that the percentage stainable pollen differed according to the direction of the cross. There was no relation between the influence of male parents on the pollen fertility of their progeny when crossed and their own pollen fertility or their breeding behaviour when selfed. Twenty-three fertile-pollen F_1 plants from a cross between a plant with a low percentage of stainable pollen and a plant with a high percentage produced, by selfing, progenies of which all except one segregated with respect to pollen fertility. In this one, the six plants were all fertile-pollen plants. The practical application of these findings is discussed.

291. Domin, S. I. 633.491:581.6:575(47)
(New industrial varieties of potatoes).
Narod. Komis. Piščevoĭ Promyš. Piščevaja Promyš. SSSR. Moskva (U.S.S.R. Peoples Commisariat for the Nutritional Industry. Nutritional Industry—Moscow) 1944 : No. 7–8 : 69–74.

The principal factor determining the amount of alcohol produced by a potato variety is the starch content of the tubers. At the experiment station of the U.S.S.R. sugar industry a study was made of over 400 potato varieties in respect of alcohol production, wart resistance, tuber yield and starch content and the best was found to be the German variety Ostbote, which is described. This variety has served as the standard in evaluating new seedlings, several of which are also described. They are derived from the following crosses: Mittelfrühe x [(*Solanum andigenum* var. *tocana* x Centifolia) x Katahdin], (*S. andigenum* var. *tocana*) x Oktjabrenok, and [(*S. a.* var. *tocana* x Centifolia) x Katahdin] x Oktjabrenok. In 1942, a poor year for potatoes, when the average tuber yield at the experiment station was 40–50 c. per ha., and that of the standards Ostbote and Lorh was 66–99 c., the new varieties yielded 160–189 c. per ha. In 1941, which was a rather better year, they yielded 220–250 c. per ha. and exceeded Ostbote in starch content by 10–20%. In good years such as 1940 and 1943 the tuber yields were from 368 to 446 c. per ha. and the starch yield from 70 to 87 c. per ha. Variety 15567 is an early variety, 15555 and 15627 are mid-early and 15698 is mid-late, though earlier than Ostbote. All the new varieties respond well to intensive conditions of cultivation but yield better than the standards also under less favourable conditions.

292. Veenbaas, M. A. 633.491:581.6:575(49.2)
De consumptiewaarde van aardappelen in verband met het kweken van nieuwe rassen. **(The consumption value of potatoes in relation to the breeding of new varieties).**
Meded. LandbvoorlichtDienst Wageningen 1947 : No. 50 : Pp. 40.

It is important for the breeder of new varieties to have a knowledge (1) of what qualities a new form should possess in its most perfect form, and (2) of the good or less desirable features of existing varieties, from which parent forms may ultimately be chosen. The present booklet therefore considers the characteristics which determine consumption value, i.e. feeding value combined with edible quality, in the potato under the following heads: feeding value; properties of the raw product and the cooked product; the importance of consumption value as a factor in inheritance; the consumption value of a number of potato varieties; observations on possible lines of approach in the breeding of new strains; and the value of certain varieties in such work.
A table showing the parentage of numerous Dutch and other varieties is given, and also an explanation of the scale of points awarded for chemical composition, feeding value and quality, as shown in the various tables. This scale could also be used by breeders in judging heir own material.

293. 633.491:582:001.4
Millán, R. 633.491:581.43
Nota taxonómica de *Solanum Pocote*. **(Taxonomic note on *S. Pocote*).**
Rev. Argent. Agron. 1947 : **14** : 116–22.

The nomenclature and taxonomic descriptions of *S. Pocote* are reviewed, and an account is given of the tubercles which it forms on its roots.

294. Linton, R. D. 633.491–1.524(67.8)
Observations on European potatoes in Tanganyika.
E. Afr. Agric. J. 1947 : **13** : 19–22.

Potato variety trials conducted at Lushoto, at an altitude of 4400 ft in the Western Usambara Range, are reported. The 15 varieties tested included Kerr's Pink, Skerry Blue, Arran Chief, Flourball, Kinongo (Northern Star) and Kiraya, and the following varieties obtained directly or indirectly from the Scottish Society for Research in Plant Breeding, 653d (22), 833b (98), 834c (29), 835a (4), 914b (52), 931b (5), 1253a (25), 1256a (23) and 914a (91). Information is given on yield, maturity, resistance to several diseases, including *Phytophthora infestans*, and other characters.

295. 633.491–1.524:581.9
Portères, R. 633.491:581.143.26.035.1
La pomme de terre en Afrique Tropicale. **(The potato in Tropical Africa).**
Rev. Bot. Appl. 1947 : **27** : 341–52.

An account is given of the origin of the modern cultivated potato varieties of Europe and North America. The geographical distribution, habit, photoperiodism, interfertility and protein content of the tubers of different *Solanum* species are discussed.

296. Zvereva, P. A. 633.491–2.111–1.521.6:575.127.2:581.165.71
(Overcoming incrossability in the group *Solanum acaulia*).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : No. **6** : 18–25.

The *S. acaulia* group comprises *S. Puca*, *S. Schreiteri* and *S. depexum* and all are resistant to frosts of — 8° C.; they are however difficult to cross with *S. tuberosum*. In 1940 the method of vegetative rapprochement was applied to *S. Schreiteri* and *S. tuberosum*. Selfed seedlings of *S. Schreiteri* were grafted on to the domestic variety Smyslovskiĭ [Fürstenkrone]. Selfed seed was obtained from the scion and also from flowers pollinated with domestic varieties. The seedlings from this crossed seed however were all identical with *S. Schreiteri*. The selfed seedlings were again grafted on to Smyslovskiĭ, when they were only 2–3 cm. high. One of the grafted plants gradually deviated from the specific type and ultimately developed characters intermediate between the wild species and the domestic; it was for instance 50–60 cm. high, had long leaves with 7–8 primary and 2–3 secondary leaflets, and the flowers had clearly defined upper and lower pedicels, were pale pink in colour and in all organs resembled the domestic more than the wild form. All flowers pollinated with Smyslovskiĭ fell off before ripening, but when pollen from the scion was used to fertilize the domestic varieties Lorh, Smyslovskiĭ and Ella, all grafted on *S. Schreiteri*, and Epicure, Early Rose and Smyslovskiĭ ungrafted, good sets of seed were obtained. From these seeds 12 hybrid plants were obtained, six from pollinations of Epicure and six from pollinations of Smyslovskiĭ. Though they vary somewhat among themselves, all show a definite resemblance to *S. Schreiteri*. Hybrids G — 3 and G — 2 resisted — 6·5° C., but G — 1 and G — 4 were not resistant. Characteristics such as flowering, virus attack, etc., varied very much according to growth conditions.

In 1943 a back-cross was obtained by crossing hybrid G — 2 with a domestic variety; some 300 seedlings were sown and they differed very much in form and colour of leaves, stems, tubers and flowers; for instance some flowers had 6—8 anthers, some plants bore tubers differing in colour, etc. The seedlings were vigorous and mostly formed seed when self-pollinated or crossed with domestic varieties. The tuber yield of most hybrids was over 1 kg. A field test was carried out the following year by sowing these tubers, and the majority of the hybrids exceeded Early Rose and Wohltmann in yield; two hybrids exceeded Lorh by 7%; one was equal to Lorh and four others came very near. Some of the hybrids had higher starch contents than Wohltmann, some of them having up to 23·5%. Some 30% of the hybrids were discarded on account of attack by crinkly mosaic, a predisposition to which they had apparently inherited from *S. Schreiteri*.

Three out of 70 of the hybrids tested in the field in 1945 withstood a frost of — 5° C. accompanied by strong wind, which completely destroyed all domestic potatoes and the other hybrids.

297. De Willigen, A. H. A. 633.491–2.19:581.192:578.08(49.2
Holten in Fabrieksaardappelen. **(Cavities in industrial potatoes).**
Proefstation vor aardappelverwerking Groningen Versl. Landbouwk. Onderzoekingen., 's-Gravenhage 1947 : No. 53 : 1.A : Pp. 38.

Dutch potato starch factories use specific gravity determinations to estimate the value of their supplies. Specific gravity is, however, affected by cavities in the tubers and the present paper deals with the various causes of such cavities and the various forms of the defect.

A full description is given of the German potato Hellena which is subject to a form of hollow heart necrosis of the inner phloem and parenchyma accompanied by the formation of cork cambium.

298. 633.491–2.19–1.521.6(48.1)
Teigland, J. 633.491–2.19:001.4
Rustflekksyke hos potet. Nomenklatur og sortsundersøkelser. **(Internal rust spot in the potato. Nomenclature and variety studies).**
Meld. Stat. Forsøksstasjon Kjevik 1940 (1941) : H86–H94.
Meld. Stat. Forsøksstasjoner Plantekult. 1940 (1942).

The confusion in the nomenclature applied to the various symptoms characteristic of internal rust spot of the potato is explained with special reference to G. Ehrke's classification of the observed effects of the disease and to the views of other investigators. The varietal incidence of the different types of the malady in Norway is also recorded with tables showing the reactions observed in large numbers of varieties from various countries. The findings of German investigators regarding the type of symptoms and the varietal resistance have not been in complete agreement with the results recorded here.

299. 633.491–2.3:576.16.631.521.6
Thomas, W. D. (jun.) 632.3:576.16:575.22
Growth and variation of six physiologic races of *Actinomyces scabies* on different culture media.
Phytopathology 1947 : **37** : 319–31.

Differences are reported in the pathogenicity of six physiological races of *A. scabies* on ten potato varieties and selections. The investigations included experiments on the frequency of variation and the types of variants produced when the races were grown on different media. The tests showed that the two most pathogenic races were also the most genetically stable. Certain types of variant were produced by several races, suggesting a close genetic relationship between these races. In addition, variants were produced by some of the races while living parasitically on the host.

300. Stapp, C. 633.491–2.3–1.521.6(43)
Neuere Untersuchungen über die Resistenzverschiedenheiten deutscher Kartoffelsorten gegen *Bacterium phytophthorum* Appel. **(Recent research on the differences in resistance of German potato varieties to *Bacterium phytophthorum* Appel).**
Festschrift zur Feier des achtzigsten Geburtstages von Otto Appel Berlin-Dahlem 1947 : 36–37.

Results of older and more recent work are the basis for a classification of 65 potato varieties, chosen from the German official lists of 1943, for tests of their resistance to *B. phytophthorum*. No close correlation was found between various characteristics of the varieties and their susceptibility.

The strains Nos 14 and 43 of *B. phytophthorum* used in these tests had been used in former years; and No. 14 was found to have decreased and No. 43 increased in pathogenicity since the previous tests. E. W.

301. Bonde, R.,
Stevenson, F. J. and
Akeley, R. V. 633.491–2.3–1.521.6:575(73)
Breeding potatoes for resistance to ring rot.
Phytopathology 1947 : **37** : 539–55.

The following named and seedling potato varieties show resistance to ring rot disease

[*Corynebacterium sepedonicum* (Spieck. and Kott.) Skap. and Burk.] and have been used in experiments on breeding for resistance to this disease; Friso, President, 055 (Chippewa x Katahdin), 336–18 (President x Katahdin), 336–144 (President x Katahdin), 46952 (Earlaine x 43055) and 47102 (45146 x Earlaine). The tubers of the material under test were cut into seed pieces of appropriate size and dipped in a water suspension of the ring rot bacteria. The inoculated seed pieces were immediately planted in the field. The plants raised from the inoculated seed pieces were examined for foliage and tuber symptoms of the disease. Usually no resistant seedlings were produced from crosses between ring rot susceptible parents or by self-fertilization of a susceptible variety. Evidence was however obtained that some susceptible varieties, e.g. Sebago, possess factors for resistance which are transmitted to their progeny. When parents known to be resistant were crossed with susceptible parents a large number of resistant seedlings occurred in the progenies. When both parents were resistant, or a resistant variety or seedling was self-fertilized, a still higher percentage of ring rot resistant seedlings were obtained. President and related seedlings and varieties transmit ring rot resistance to a high percentage of their progenies, but are unsuitable as parents since most of the resistant seedlings produced are late maturing, with badly shaped tubers and other undesirable characters. The Friso variety is not a desirable parent on account of its pollen sterility. Seedlings 46952 and 47102, however, produce viable pollen and have given promising seedlings when crossed with each other and susceptible varieties and seedlings. Crosses of seedlings 46952 and 47102 with late blight resistant selections have produced a number of seedlings resistant to both ring rot and late blight.

In trials carried out in Maine during 1945, seedling 47102 gave the highest yield in comparison with five standard varieties and seedlings 055, 46952 and 336–114. Seedling 47102 has been distributed under the name of Teton (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 749).

302. 633.491–2.3–1.521.6:575.127.2(92.2)
633.491–2.411.4–1.521.6:575.127.2

THUNG, T. H.

Potato diseases and hybridization.

Phytopathology 1947 : **37** : 373–81.

An account is given of the problems of breeding for resistance to blight (*Phytophthora infestans*) and wilt (*Bacterium solanacearum*) in Java. The methods used for testing resistance to each disease are described. The resistance of varieties of *Solanum tuberosum*, the species *S. andigenum*, *S. Antipoviczii*, *S. Caldasii*, *S. chacoense* and *S. demissum*, and the progenies of hybrids between cultivated potatoes and these five wild species has been studied. Most of the wild species have proved to be highly resistant to both blight and wilt. Several races of *S. demissum*, however, have exhibited blight immunity but susceptibility to wilt. F_1 hybrids between wild species and *S. tuberosum* have shown a lower degree of resistance to blight and also to wilt than the parental wild species. Backcrosses with *S. tuberosum* in either direction, however, do not exhibit a further diminution in resistance, but an increase in resistance in comparison with F_1 progenies. Several of the resistant progenies, in particular those of the crosses *S. tuberosum* (wild species x *S. tuberosum*) yield well-formed tubers with fairly good taste and flat eyes. Further backcrossing is to be effected to improve tuber size, particularly in wilt resistant material.

303. 633.491–2.411.4:576.16:631.521.6(41)

BLACK, W. and HAIGH, J. C.

Strains of potato blight in Scotland.

Scot. J. Agric. 1947 : **27** : 49–50.

The results of recent investigations in Scotland on strains of potato blight and the problems of varietal resistance are summarized.

304. 633.491–2.411.4:575.16:631.521.6:575

BLACK, W.

Blight resistance in potatoes.

J. Minist. Agric. 1947 : **54** : 198–200.

Work on the breeding of potato varieties resistant to the three strains of blight is reviewed.

305. 633.491–2.411.4–1–521.6(48.5)
633.491–1.521.5
Åtgärder för bekämpande av bladmögel och brunröta hos potatis. (**Measures for combating blight and brown rot in potatoes**).
Flygbl. Växtskyddsanst., Stockh. **1946** : No. **80** : Pp. 8.

The most resistant varieties are slow growing and are therefore of limited use in regions of Sweden with a short vegetation period.

On the basis of information from abroad and also reports from Swedish growers during 1933–38 regarding the resistance of varieties on their land to blight, a short list is given of over 30 varieties grouped according to their susceptibility or resistance. Synonyms are given.

306. Holmberg, C. 633.491–2.412.5–1.521.6:575"793"(48.5)
Drivbänksförsök med tidiga kräftimmuna potatissorter. (**Forcing frame experiments with early wart immune varieties of potatoes**).
Växtskyddsnotiser **1946** : No. **3** : **40–42**.

The effect of very early harvesting was studied in certain early wart immune varieties of potatoes at the official Plant Protection Institute (Statens Växtskyddsanstalt) in Sweden. Puritan, taken as a standard, was surpassed by 24% in yield by the variety W. 40731 which is not yet on the market. W. 40731 has badly shaped tubers. Another strain Sv. 42096 held its own with Puritan and has a very attractive looking tuber when harvested at an early stage.

307. Müller, K. O. 633.491–2.485–1.521.6
Über die Schadwirkung der *Rhizoctonia solani* K. bei der Kartoffel. (**The injurious effect of *R. solani* K. on the potato**).
Nachrbl. Dtsch. Pflschdienst. **1947** : **1** : **47–51**.

With deep planting the differences in growth, number of stems and yield between infected and control plants were greater than with shallow planting. The variety Aquila reacted less markedly to infection than Frühmölle. The infected series of plants nearly all had lower yields; the damage due to the parasite is not confined to the young growth; older plants though affected showed no characteristic symptoms, but the disease was chronic in type. The variety Erdgold has a high regenerative capacity, but pot experiments seemed to show that susceptibility and regenerative capacity are not mutually exclusive.

E. W.

308. Thomas, D. C. 633.491–2.6–1.521.6(42)
Some observations on damage to potatoes by slugs.
Ann. Appl. Biol. **1947** : **34** : **246–51**.

The Arran Banner, Majestic and Arran Peak potato varieties were tested in experimental plots at the Seale-Hayne Agricultural College, Devon, for their susceptibility to damage caused by slugs (*Arion hortensis* and *Milax gracilis*). Significant varietal differences in susceptibility were observed. Arran Banner was the most damaged variety and Arran Peak the least damaged; Majestic occupied an intermediate position as regards slug injury. Varietal differences in the extent and time of the injury to the tubers were found to be associated with differences in dates of tuber maturity, little damage being observed before the tubers attained maturity. The results therefore emphasize the need for prompt lifting of the mature crop.

309. Boczkowska, M. 633.491–2.7–1.521.6(43.8)
Recherches sur les affinités existant entre le doryphore (*Leptinotarsa decemlineata* Say) et diverses variétés polonaises de pommes de terre. [**Investigations on the affinity of the Colorado beetle (*L. decemlineata* Say) for different Polish potato varieties**].
Ann. Épiphyt. **1945** : **11** : **191–221**.

The characteristics, possessed naturally or produced artificially, which enable potato varieties to resist the attacks of the Colorado beetle are enumerated.

The life and development of the Colorado beetle on Hetman, a very susceptible variety, are described in detail, and nine other Polish varieties, viz., Kmieć, Marszalek, Mazur,

Odyniec, Palatyn, Przebój, Rosafolia, Sobieszyńskie and Stefania, are compared with it as regards their influence on the different stages of the life history of the insect. They are found to differ widely in this respect.

310. Rozendaal, A. 633.491–2.8–1.521.6
Virusziekten van aardappelplanten. (**Virus diseases and potato plants**).
Landbouwk. Tijdschr. Wageningen 1946 : **58** : 533–43.

The names and effects of virus diseases, variation and mutation in viruses, and resistance of potato varieties to virus infection are touched upon in this paper and the ensuing discussion.

311. Köhler, E. 633.491–2.8–1.521.6:575
Das Verhalten der Pflanzen gegen Virusinfektionen. Versuch eines Systems der Resistenzerscheinungen unter besonderer Berücksichtigung der Kartoffelzüchtung. (**The behaviour of plants towards virus infection. A suggested classification of resistance phenomena with special consideration of potato breeding**).
Festschrift zur Feier des achtzigsten Geburtstages von Otto Appel, Berlin-Dahlem 1947 : 30–31.

The various kinds of plant resistance to viruses, viz. (1) preimmunity, (2) "cross resistance," i.e. conferred by the presence of a related virus in the host, (3) tolerance, (4) localized resistance, (5) acquired resistance and (6) resistance by amputation, are classified under main headings A and B, according to whether the virus multiplies in the inoculated cell or not; A is further divided into types and B into categories and types; examples of all types are given.

A genetic analysis to discover the mode of inheritance of the resistance types 1, 3 and 4 is important as an aid to breeding potatoes for various resistance. For breeders the most promising fields of research are in breeding for preimmunity to the mosaic viruses A and X, for tolerance to leaf roll virus, and for localized resistance to the Y virus. E. W.

312. Bode, O. 633.491–2.8–1.521.6:578.08
Beitrag zum frühzeitigen Nachweis der Blattrollkrankheit der Kartoffel durch Anfärbung des Phloems. (**Contribution to early diagnosis of leaf roll disease in the potato by staining the phloem**).
Festschrift zur Feier des achtzigsten Geburtstages von Otto Appel, Berlin-Dahlem 1947 : 34–36.

Fuchsin was used for staining. In sections from diseased plants the phloem cells were stained bright red to dark crimson, according to the severity of the disease, which depends on the length of the infection period and the susceptibility of the variety. The phloem in sound plants remained unstained. Differential staining is possible by using Rhodamine B and Coryphosphine.

Fourteen officially listed varieties were tested for differences in the incidence of necrosis, etc. In most of the varieties the inner phloem was diseased, but in some both the inner and outer phloem was affected, and in others only the outer. The varieties showed clear differences in resistance, in the number of diseased cells and in the intensity of the changes. Tolerance, as deduced from intensity of necrosis, and the yield of tubers were also studied. Results showed that severe degeneration accompanied marked necrosis of the phloem, and varieties showing slight decreases in yield also showed less staining. E. W.

313. Harris, M. R. 633.491–2.8–1.521.6:578.08
Accuracy of the ultraviolet light method in selecting potato tubers free of virus.
Amer. Potato J. 1947 : **24** : 179–83.

The value of ultraviolet light in detecting the presence of leaf roll virus by the fluorescent effect was studied in several commercial and seedling potato varieties. No consistent correlation was found between fluorescence and the presence of virus in the tuber.

314. 633.491–2.8–1.521.6:581.6(49.4)
SALZMANN, R. 633.491–2.19(49.4)
Bericht über die Hauptversuche des Jahres 1945. (**Report on the principal researches of the year 1945**).
Tätigkber. Verein. Schweiz. Versuchs-Vermitt. Saatkartoffeln 1946 : 37–59.
Information is given on the yield, dry matter and starch content, and susceptibility to viruses, internal rust spot, blueing, and brown and hollow heart of the following potato varieties: Allerfrüheste Gelbe [Yellow Earliest of All], Rema, Centifolia, Olympia, Speisegold [Culinary Gold], Gelbe Speise [Yellow Culinary], Admiral, Aquila, Monika, Pommerania, Roswitha and Ackersegen. The experiments were replicated over a chain of Swiss experimental plots.

315. MACDERMOTT, N. 633.491.00.14(42)
New varieties of potatoes.
Agric. Progr. 1946 : **21** : 97–102.
The problems involved in the testing and introduction of new potato varieties and the guarantee that the varieties distributed are really suitable for commercial cultivation are examined. Many recently developed varieties are discussed in the light of present-day commercial requirements.

316. DIEHL, R. and
TSVETOUKHINE [CVETUHIN] 633.491.00.14(44)
Les essais de variétés de pommes de terre à Rennes de 1942 à 1945. (**Tests of potato varieties at Rennes from 1942 to 1945**).
La Pomme de Terre Française 1947 : **10** : 8–12.
Information is given about the average yields and other characteristics of potato varieties tested in two, three or four different years at Rennes, Brittany.

317. RASSMUSSEN, F. K. 633.491.00.14(48.1)
Potetsortforsøk 1935–39. (**Potato trials 1935–39**).
Meld. Stat. Forsøks. Vågønes 1939 (1941) : **28** : H5–H68.
Meld. Stat. Forsøksstasjoner Plantekult. 1939 (1941).
The origin and synonyms of many of the thirty-four varieties in these trials are mentioned, in discussing their individual performance for which tuber size was one of the criteria. The Mandel, Sagerud and Ås potatoes are discussed at some length, the last named being of special interest as exhibiting the greatest resistance of the haulms to blight. The incidence of other diseases in different varieties was also recorded.

318. 633.491.00.14(49.2)
HAAN, H. DE 633.491–1.521.5(49.2)
De ontwikkeling en de beteekenis van de rassenlijst voor landbouwgewassen (1924–1944). [**Development and importance of the Dutch list of varieties of agricultural crops (1924–44)**].
Landbouwk. Tijdschr. Wageningen 1944 : **56** : 78–86.
The list is defined as a register, compiled by an authorized body, of the names of the varieties that are of importance in cultivation. It must include descriptions of the varieties and arrange them in order of merit.
The history of the register is given from its foundation in 1924 and a brief description of the changes in contents of the twenty editions published.
The essential point of the Dutch register is not only that the varieties are arranged in their order of merit as recommended for planting or for experiment, but also that descriptions of varieties of practically every agricultural crop are included. For many crops yield and price tables are given, while in the chapter on potatoes, a summary of yield of dry matter is included. Statistics of varieties during the past year, areas and percentages of total area planted, are given for each crop for each district and for the whole of the Netherlands.
The register has reduced the number of varieties by refusing to register synonyms or even new varieties that possess insufficient value and by removing varieties that are unsatisfactory from the approved list. It has also insisted on distinctive names for varieties before registration.

Foreign varieties, not included in the register, may only be imported under special licence. The register is of importance to breeders because it gives a summary of the best varieties and data on good and bad qualities, drawing attention to the qualities that new varieties should possess and the shortcomings of the existing varieties. C. B.

319. COCKERHAM, K. L. and DEEN, O. T. 633.492–2.7–1.521.6

Resistance of new sweetpotato seedlings and varieties to attack by the sweetpotato weevil.

J. Econ. Ent. 1947 : **40** : 439–41.

Different sweet potato seedlings and varieties were tested for resistance to the weevil, *Cyclas formicarius elegantulus*, Summers. In two years of testing, Menes Moeder (U.S. Introduction 47442) was the most heavily infested. Unit I Porto Rico had the least number of infested potatoes of the varieties and seedlings tested in 1941 and 1942. It was concluded that varieties with large, soft crowns or stems are favourable to weevil infestation and varieties with long roots tend to be more resistant. Seedling No. 32–10–5 showed consistent resistance in two successive years.

The moisture, starch and carotene content of tubers of seedlings and varieties showing the highest and lowest weevil infestation during six years are tabulated. Seedlings with lowest infestation were high in moisture and carotene and low in starch content.

FIBRES 633.5

320. 633.51:575

Empire Cotton Growing Corporation. Report of the Administrative Council of the Corporation submitted to the twenty-sixth annual general meeting on June 3rd, 1947.

Rep. Emp. Cott. Gr. Corp. Lond. 1945–46 (1947) : Pp. 24.

A summary is included of recent breeding and other investigations on cotton carried out in the various countries concerned (cf. Abst. 321).

321. 633.51:575

Progress reports from experiment stations. Season 1945–1946. Programmes of experiments. Season 1946–1947.

Emp. Cott. Gr. Corp. Lond. 1947 : Pp. 132.

Wells, W. G. *Queensland. Regional Experimental Station, Biloela. Progress Report for 1945–46 season.* (*pp. 1–9*).

The 43–9 strain of Miller possesses a high lint percentage in comparison with the parental stock. The strain is to be carefully tested, however, as some evidence has been obtained in the past that under adverse conditions varieties with a high lint out-turn may fail to produce fibre of good strength.

The work of developing jassid resistant strains by selection of Miller or by crossing Miller and other varieties with Ferguson, U.4 and a Rhodesian cotton was continued. No jassid attack occurred in the plot of 64 Miller strains; but the degree of leaf hairiness of most strains was satisfactory. Families III–17 and III–165 have promise of providing strains with better lint length than the previously released jassid-resistant Miller strains, lots one and two.

A sparsely fuzzed Miller selection has also been secured, designated lot 1–19–2, with a ginning percentage of 38. Mass-selected stock from Miller 41 S is to be tested in strain trials and commercial plantings.

Back-crossing the hybrid Miller x U.4 to Miller for four generations has been effected. Observations on leaf hair density show that the transference of leaf hair cover from a hirsute to a non-hirsute variety is possible, and that this hair cover can be retained by selection even after four generations of back-crossing to the non-hirsute parent. In addition, the back-cross hybrids possess boll weights and fibre types similar to those of the large-bolled Miller parent.

Back-cross hybrids involving Ferguson were in all cases more hirsute and vegetative than back-cross hybrids involving the Rhodesian cotton, and also later in maturity; it has been possible, however, to select plants combining a fairly open growth habit, which is desirable in Queensland, with high leaf hair density and freedom from jassid injury.

MacDonald, D., Fielding, W. L. and King, H. E. — *South Africa. Cotton Experiment Station, Barberton. Progress Report for the season 1945–46.* (*pp. 10–19*).

A balanced incomplete block trial including 23 strains of U.4 x Cambodia and U.4 x M.U.8 and two standard U.4 strains is reported.
Seed of the A.2106 strain of the hybrid Cambodia x U.4/5143 is available for distribution.
Work on the following hybrids is reported: U.4/5143 x Cambodia and U.4/8161 x M.U.8; M.U.8 x Tidewater; 5143 x B.P. 52 and M.U.8 x B.P.52; M.U.8 x Sea Island; crosses of Sea Island, Egyptian and Tangüis with B.P.52; U.4/8161 x Sea Island; and U.4/8161 x Egyptian.
Counts of jassid nymphs on the foliage of American Upland types again showed a consistent relationship between the degree of resistance and degree of leaf hairiness. Hair development throughout the growth of the plant, and effects of varying conditions of plant growth upon hairiness are being studied. Differences were again noted between the rates of hair development in *Gossypium hirsutum* and *G. barbadense*; it appears probable that a slower rate of attaining hairiness characterizes *G. barbadense*. Records were made on the degree of hairiness of hybrid types; breeding for improved hairiness, i.e. greater length of hair combined with high density, has achieved marked progress in M.O.8, the most hairy strain of *G. hirsutum* known at Barberton.

Cameron, G. S., McKinstry, A. H. and Mitchell, B. L. — *Southern Rhodesia. Season 1945–46.* (*pp. 32–33*). *Cotton Research Station, Gatooma. Progress Report for the season 1945–46. Part I and part II.* (*pp. 32–49*).

The incomplete block arrangement has given more satisfactory statistical data in strain trials than the randomized block. A trial of 15 strains was carried out, including 7C families derived from the back-cross (64/7/10 x Cambodia) x 64/7/10, 7L5 strains derived from 64/7/10, and 9L34 strains derived from 64/V.
Selection work has been mainly devoted to the improvement of lint quality in 7C strains, and improved uniformity in the jassid resistance of 9L34 and 7L5 derivatives.
A range of Gatooma strains of cotton has been found to be highly intolerant to galling by tobacco eelworm.

Anson, R. R., Knight, R. L., Evelyn, S. H. and Rose, M. F. — *Anglo-Egyptian Sudan. Progress Report of the Plant Breeding Stations, season 1945–46.* (*pp. 50–75*).

The following work on Egyptian cotton is reported at the Gezira Station:—
Selection for earliness or low node number has been carried out in Domains Sakel; a large number of single plant progenies with node numbers as low as six are to be tested in the crossing season.
The random "filtering" of Domains Sakel, X.1730A and the blackarm resistant X.1730 varieties was continued, giving good results. The lint samples of "filtered" Domains Sakel showed superior fibre characters and spinning capacity in comparison with the commercial Domains Sakel.
Selection of Domains Sakel and Masseys Domains Sakel for leaf curl resistance is showing positive results.
Varietal trials are reported.
The following investigations have been conducted at the Shambat Station:
The work of transferring the genes B_1, B_2 and B_3 for blackarm resistance from the resistant NT.2, a leaf and resistant selection of Sakel, to Domains Sakel was continued.
Investigations on NT.2 types have now ceased, since these cottons are inferior to Domains Sakel in quality and earliness, whether susceptible or resistant to blackarm.

The BAR. 1730 L strain, carrying gene B_2 for blackarm, was produced by the seventh back-cross of the American Upland cotton, Uganda B. 31, by varieties of the X.1530–X.1730 group of Sakel selections. Under conditions of blackarm control, BAR. 1730 L and X.1730 A have been equal in lint yield and spinning quality over a four-year period; BAR. 1730 L is to be tested on a commercial scale.

The blackarm immunity of *G. sanguineum* [*G. arboreum* L. race *bengalense* (Silow)] has been found to depend upon two genes. The weaker of these genes was successfully carried to the sixth back-cross with Sakel; early back-cross material is being sown again in the hope of recovering the stronger factor.

The genetical basis of blackarm immunity in *G. anomalum* is being investigated; this species has been crossed with a fully susceptible *G. arboreum* cotton from Java; seed of the back-cross to Java has been secured for sowing next season.

BAR.SP.84, the blackarm resistant form of Uganda SP.84R, has been accepted as the future commercial cotton for the Kordofan and Equatoria provinces, and all work on the transference of blackarm resistance to other Upland varieties has ceased, with the exception of transferring B_2 and B_3 to Uganda BP.52.

The following additional cottons have been examined for their reaction to blackarm: *G. Sturtii*, susceptible; *G. Davidsonii* var. *Klotzschianum*, resistant; *G. somalense*, resistant; and *G. barbadense* var. *Darwinii*, susceptible.

In work on pink bollworm (*Platyedra gossypiella*) resistance, six F_1 seeds of the cross Sakel x *G. Thurberi* were soaked in 0·5% colchicine for 48 hours. All six seeds produced hexaploids which have been designated *G. thurbadense*. The hexaploid form resembles *G. Thurberi* in being resistant to pink bollworm. F_1 plants were raised from crosses between *G. thurbadense* and Domains Sakel; these were very uniform, and were presumably types with 65 somatic chromosomes including a complete set of *G. barbadense* chromosomes and a single set of *G. Thurberi* chromosomes. The resistance of *G. Thurberi* appears to be recessive, since none of the latter F_1 plants were resistant. The F_1 families have been back-crossed to Sakel, and the resulting seed will be sown next season. The hexaploid *G. armadense*, obtained from the cross *G. armourianum* x Sakel, was successfully crossed with Sakel. The F_1 families were not as uniform as the comparable *G. thurbadense* hybrids, indicating a stronger residual homology between the genome of *G. armourianum* and the D genome of Sakel than between the genome of *G. Thurberi* and the D genome of Sakel.

In breeding for jassid resistance, the work of transferring hairiness from various types to Sakel was continued. N.T.2 x Tangüis selections carrying the Tangüis gene H_1 for hairiness show a satisfactory spinning performance; the H_1 gene is now being re-transferred from N.T.2 to Domains Sakel. A *G. arboreum* gene for hairiness, designated H_3, has been found in *G. sanguineum*, and is being transferred to Sakel. The relationship between H_1 and H_3 is to be analysed. The transference of a hairiness gene from Carpulla (*G. barbadense*) to Domains Sakel reached the fifth back-cross stage. Transferences from *G. tomentosum*, St Ignatius, M.U.86, Ferguson and Kapas Purao are in the first back-cross stage.

An attempt is being made to transfer the useful character of shedding the bracteoles before picking time of an Upland variety to Domains Sakel.

The transference of the Egyptian "short branch" character and of the "cluster" character of an Upland cotton to Sakel is also being attempted, in view of the possibility of mechanical picking in the future.

Selections of NT. 205/45 and B.181 (ex Uganda), and new introductions from Nyasaland, were studied at the Kadugli Station. The NT. 205/45 progenies gave good results; eight of them are to be bulked to form a new nucleus for multiplication. The B.181 selections were all discarded on account of their low ginning percentage. Single plant selections of some of the Nyasaland strains are to be grown next year.

In varietal trials at Kamina Farm and Talodi, BAR.SP.84 has outyielded the Pump Scheme strain control. Spinning tests showed that BAR.SP.84 has a somewhat higher hair weight than the Pump Scheme strain but that its fibre is less strong.

Varietal trials were carried out in the Equatoria Province. BAR.SP.84 gave the highest seed cotton and lint yields, and in two of the three trials its ginning out-turn exceeded that of 511 D by 2·5%. BAR.SP.84 is being bulked to replace 511 D, a single plant selection of Uganda S.G. 85.

Jameson, J. D. and Weatherley, P. E. — *Uganda. Cotton Experiment Stations, Kawanda and Serere. Progress Reports for the season 1945–46. (pp. 76–89).*

At Kawanda, the work of transferring blackarm resistance to BP.52 was continued. Breeding for wilt resistance is receiving attention.

The systematic transference of the R_1 gene for red plant body to strains with different types of plant habit has begun, with a view to elucidating linkage relationships and the adaptive advantages of different plant habits under conditions of blackarm and *Lygus* attack. The following three features of plant habit are to be studied, singly and in combination: (1) the semi-cluster habit as described in America; (2) strong development of the basal monopodia; and (3) the development of subsidiary monopodia from buds which remain dormant in the normal plant.

The transference of the hairiness of *G. tomentosum* from *G. tomentosum* x *G. hirsutum* to MU.8A and BP.50, which have normal hairiness, has been begun in an attempt to obtain *Lygus* resistance.

The okra leaf character is being introduced into BP.52, with a view to investigating the effect of a more open plant ecoclimate upon insect behaviour.

The results of varietal trials are summarized.

The following investigations were carried out at the Serere Station:—

As a result of selection for blackarm resistance, six resistant N.17 selections, six resistant B.181 selections and a bulk mixture of BP.50R have been secured; the results of testing these selections in comparison with the parental types and other commercial cottons are reported. The chief varieties included in the district variety trials were N.17, BP.52, BP.50 and B.181; K.P.28 (ex. B.181), S.4105 (ex N.17 M2) and S.P.84 (ex U.4/4/2) were also included, according to the particular locality.

Single plants of blackarm resistant KP.28 and BP. 50R were selected on the basis of vegetative characters.

Peat, J. E. and Bebbington, A. G. — *Tanganyika Territory. Lake Province. Ukiriguru and Lubaga Experiment Stations. Progress Report for the season 1945–46. (pp. 90–105).*

A seed mixture comprised of the following seven strains from Ukiriguru and Lubaga with the Mz. type of lint has been issued in the Lake Province: UK. 3/17, UK. 3/33, UK. 4/53, UK. 4/86, L. 2/14, L. 2/62 and L. 3/1. All the strains possess a higher degree of jassid resistance than M2. 561, which cotton it is proposed the mixture should replace. Observations are given on the performance of the following crosses: Barberton U. 4 x Cambodia, U.4 x M.U.8, U.4 x Cambodia hybrids from Gatooma, and Barberton U.4 x Sea Island.

A wide range of single plant selections is to be grown in the 1946–47 season.

Varietal trials in the Eastern Province included B.P.52, M2. 561, Eastern Province Local, Kingolwira selection 553, and M.U. 8A; insect attack was very severe during the year under review, but in spite of this M.U. 8A, a strain of Malwa Upland, cropped well.

Selections of the local cotton show promise with regard to yielding capacity and lint quality. Early maturing selections have been taken from the Sea Island x U.4 crosses received from Barberton.

Ducker, H. C., Hoyle, S. T. and Miller, W. L. — *Nyasaland. Cotton Experiment Stations. Domira Bay Station. Progress Report 1945–46. (pp. 106–18).*

The performance of C.L. 20–20 and B.181 suggests that resistance to blackarm may lead to improvement of quality, but it is still doubtful whether under Nyasaland conditions the use of resistant types will invariably affect yield. M2. 561 is giving unsatisfactory yields; B.P. 52 cotton is inferior in yield under summer crop conditions.

Single plant selection has been carried out in T. 22, C.L. 20–20, C.L. 20–34, C.L. 20–46, B. 181 and B.P. 52, and also the green-seeded derivative of A. 2208, a hybrid between U.4 and M.U.8. New crosses have been effected between B. 181 and Y. 22; C.L. strains, B.P. 52 and A. 250, have also been crossed with the hybrid B.P. 50 x 181.

Co-operative breeding work is to be carried out between the Domira Bay Station and the Shambat Station in Sudan; among the parents used for crosses made in the Sudan is H.K. 2, the highest yielding cotton so far selected in Nyasaland.

Nigeria. Progress Report on cotton growing in the Northern Provinces for the season 1945–46. (*pp. 119–23*).
Progress Report on work on cotton in the Southern Provinces for the season 1945–46. (*pp. 123–24*).

Trials are reported. Hybridization work is to be resumed in 1947.
A trial of eight Ishan A strains was conducted. Single plant selections were obtained from the highest yielding strain, A6s.

Harper, A. S. and Nanton, W. R. E. — *West Indies. Cotton Breeding Station—Montserrat. Progress Report for the year 1946 and programme of experiments for the year 1947.* (*pp. 125–29*).
Progress Report on the cotton breeding work at Camden Park Experiment Station, St. Vincent, for the season 1945–46. (*pp. 130–32*).

Progeny trials of the families M. 4208, M. 4210 and M. 4213 are reported.
Work was carried out on the V. 135 (V. 46) seed renewal scheme.
The VH hybrid breeding trial included VH. 8, VH. 10 and other VH progenies together with B.S.I., M.S.I. and V. 135 for purposes of comparison; large and significant differences between the strains were obtained. As a result of recent spinning tests, it has been decided to continue selection work on only the VH. 8 material.

322. 633.51:575(54)

25th Annual Report of the Indian Central Cotton Committee for the year ended 31st August, 1946 : Pp. 123.

The cotton improvement work carried out in the Provinces and States during 1946 is summarized below.

Bombay
The development of high-yielding cottons with increased fibre length was continued at Broach; breeding for wilt resistance is carried out at Poona, under optimum conditions of wilt infection. The synthetic strain Vijaya derived from selections 1–2 and 1–6 is described as highly resistant to wilt. Its ginning percentage is 41 as against the 33·7% ginning value of B.D.8 and 41·3% of Broach Local. Its spinning value is 38s; the spinning values of B.D.8 and Broach Local are 38–1/2s and 13–1/2s, respectively. Approximately 200 selections derived from crosses between 1027 A.L.F. and B.C. 1–2, B.C. 1–6 and B.C. 5–18, possessing a ginning percentage of 38 to 42, a staple length ranging from 21 to 23 mm. and wilt resistance, were studied in the F_3 and F_4 generations; selections combining desirable characters were obtained for further study. Selections showing early maturity and other valuable characters were obtained from crosses involving the early Maktampore strain, the early B.D.8 strain, B.C. 1–2 and B.C. 1–6.
In the Talgaon breeding scheme, selections 197–3, 403–5 and 670–4, derived from the cross Jarila x N.R.5, showed superiority over Jarila in yield and ginning percentage, as in previous years. Selection 197–3 is considered to be the most promising of the three selections, all of which are highly wilt resistant. The following cross has been effected to improve the yield, ginning percentage and wilt resistance of 197–3 and 670–4: [(197–3 x 176–2) x 670–4] and 670–4 x 9–2–8–3.
Work at Surat aims at developing a strain completely resistant to wilt and adapted to conditions in the Surat tract; selections from the crosses 8–1 x K.F., 8–1 x B.C. 1–6, 1027 A.L.F. x B.C. 1–6, and Seg. 22–3–3–8 x B.C. 1–6, are under investigation. Work on crossing Asiatic and American cottons has been carried out at Surat since 1932. During the year under review, ten synthetic types derived from advanced generations of the back-crosses (American x Asiatic) x American were tested in replicated trials in comparison

with 1027 A.L.F. and Co.2; seven of these equalled 1027 A.L.F. in yield, and were superior to it in ginning out-turn and staple length. Other interspecific hybrid selections have given promising results at various localities. Varieties of *Gossypium hirsutum* adapted to the black soil rain fed areas have been crossed *inter se*; crosses have also been effected between interspecific hybrid strains. Cytological studies were carried out on progenies of pentaploid and hexaploid cottons with a view to investigating the relationship between chromosome pairing and fertility.

The improved close boll type, K. 72–2, is superior to the Wagotar cotton of the Wagad tract in yield of lint per acre and spinning capacity; its ginning percentage is, however, lower by 1·5–2%. It is suggested that K. 82–2 should be multiplied to replace Wagotar.

In the Kaira district, work is in progress to obtain a superior type of cotton to replace the Rozi cotton (*G. arboreum* var. *typicum*) now grown on the goradu soils; three selections derived from the cross Gaorani x Rozi show increased staple length and ginning percentage in comparison with Rozi, and are to be tested in replicated trials.

Work on the Dharwar-American cottons at Gadag aims at the development of an early maturing type superior to Gadag 1 in yield, staple length, ginning percentage and resistance to red leaf blight. As in previous years, the two strains 9766 and 4411 were tested against Gadag 1. The strains maintained their superiority over Gadag 1 in ginning out-turn and staple length; in spinning capacity the strains were slightly inferior. Contrary to the results of previous years, Gadag 1 equalled the two strains in yield instead of showing a lower yield. Family 9–3, derived from the cross Gadag 1 x Co.2, again proved superior to Gadag 1 in yield, ginning percentage, staple length, and early maturity.

Investigations at Poona on the "small leaf" disease were continued.

Sind

At the Mirkpurkhas and Oderolal stations, work is being carried out on the hybridization between long staple Upland types from world sources and the hardiest Upland cottons of Sind, with a view to producing long staple strains. Strains 41/4 (D.T. Webber x M.4) and 45/2 [(M.4 x Wilds) x M.4] show promise as long staple strains giving good yield and ginning out-turn.

Punjab

The 268F long staple strain offers prospects of replacing the medium staple 4F cotton in the Jhang district; it is superior to 4F not only in technological properties but in yield and jassid resistance.

The improved desi variety, 231 rosea, has given high yields and ginning percentage in tests at the Hansi Sub-station.

Work on American cottons has resulted in the selection of the strain 216F, which should be suitable as a replacement of desi cotton in the irrigated areas of the south-eastern districts in the Punjab. Promising selections have been derived from crosses between the Cambodia strain from Barberton and Punjab-American cottons.

The object of the cotton improvement scheme in the south-western tract of the Punjab is to produce long linted types of American cotton, by selection of local material and by crossing Punjab-American types with introduced Upland varieties.

Re-selection of the 289 F/K.25 variety in the Lower Bari Doab Canal Colony has resulted in the production of three new strains 330F, 331F and 332F, superior to 289F/K.25 in yield, ginning out-turn and other technological properties. Two new strains, A.C. 84 and A.C. 85 have been selected from the cross 289 F/K.25 x 289F/43; they surpass 289 F/K.25 in yield and ginning out-turn, and are highly resistant to jassid. Re-selection of 289F/43 gave six new strains, of which the 238F strain is considered to be most promising.

Central Provinces and Berar

The three improved strains of Buri cotton, Nos 0396, 0394 and 0382, have maintained their superiority over Buri 107, 103 and local Buri, in respect of yield and ginning percentage; No. 0382 is reported to have a spinning capacity of 50s and 33% ginning value.

The H.420 strain is considered suitable for replacing Jarila in the entire Oomras tract and also in part of the area cultivated under V.434; it is high-yielding, and has a higher spinning value than V.434 and Jarila.

Madras
Work is being carried out to improve the short staple Mungari cotton grown on the red and mixed soils of Madras Province. Selection 881F has continued to give satisfactory results in varietal tests at several localities. Crosses involving P.26H, P.710, Jarila, M.274 and M3 have yielded the most useful selections; promising families are to be tested in comparison with 881F and local Mungari for yield, earliness and other characters. Further crosses have been made, involving local selections, early maturing and stenosis resistant types. Selection of a suitable American type for the red soils of the Anantapur and Cuddapah districts is receiving attention; it is expected that the fibre characters of selections would easily surpass those of the bulk Dharwar-American and Mungari cotton now cultivated.
Work on Cocanadas cotton aims at improving yield and ginning percentage, while at the same time preserving the light pinkish colour of its lint.
The study of deep-coloured selections of Cocanadas cotton has indicated that many hybrid cultures breeding true to deep colour have a higher ginning percentage than the control G.1, but a coarse staple; to correct this staple character, intervarietal hybridization is being carried out, using as parents coloured fine Indian varieties. Further crosses between early coloured varieties and early white types were made, to develop a coloured biotype for the Chinnapathi area.
The objects of the breeding scheme in the Ceded Districts of Madras Province are to produce a long staple American cotton capable of producing good yields when grown as an irrigated rabi or winter crop, and an American type suitable for cultivation in the unirrigated regions. The results of varietal trials of American cottons, conducted with a view to future breeding work, are reported (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. **1441**).

United Provinces
Hybrids between desi cottons and Jarila, Million Dollars and other cottons possessing superior quality are being investigated, to improve the spinning quality of desi.
Crosses have been made to secure strains superior to Perso-American cotton in yield and quality, using as parents Perso-American, Punjab-American, Parbhani-American, Cambodia, Irans and M.4.

Hyderabad
It is hoped that a strain superior to Gaorani 6 in spinning value, ginning out-turn and wilt resistance will be obtained in the near future. The isolation of a strain with higher ginning percentage from G.12F–2 and of an early maturing selection from G.4M–11 is being attempted. Strains of Upland cotton are under test for their adaptability to the highland area of Adilabad.
The work of improving the cotton of the various districts of the Oomras tract has the following objectives: the production of (1) an early maturing strain of Gaorani 12F with a high ginning percentage; (2) an early maturing strain of Parbhani-American cotton, with a high ginning percentage; (3) a wilt resistant strain of G.16C by hybridization with New Million Dollar; and (4) a quick maturing, drought and wilt resistant variety giving a high ginning out-turn and capable of spinning 12–16s highest standard warp counts.
The improvement of Kumpta cotton by selection of the local Raichur variety is in progress; tests of new Kumpta strains are reported.

Baroda
Strain S.31 again showed superiority over S.24–2 and local Mathio cotton in staple and spinning capacity.

Mysore
Tests of Mysore-American and Egyptian varieties were conducted.

323. SANKARAN, R. 633.51:575(54.7)
Cotton growing in Sind.
Indian Cott. Gr. Rev. 1947 : **1** : 107–16.
An historical account is given of cotton growing in Sind.
The Sind deshi cotton consists of a mixture of four genotypes belonging to the species *Gossypium arboreum* var. *neglectum* f. *bengalensis*. The four genotypes are distinguished

as follows: (1) white flower and narrow leaf lobe (Roseum); (2) white flower and broad lobe (Cutchicum); (3) yellow flower and narrow leaf lobe (Verum); and (4) yellow flower and broad leaf lobe (Malvense). The four genotypes were isolated and selected on the basis of yield, bright lint colour and high ginning out-turn. The white flowered types proved more hardy than the yellow flowered types; they also gave a higher ginning out-turn. Of the two white flowered types, Roseum was found to be the higher yielding; pure line selection within this type resulted in the strain known as Sind N.R.

In work on Punjab-American cotton (*G. hirsutum*), Sind-Sudhar and M4 were selected from 289F and N.T.21, respectively. Sind-Sudhar and M4 are similar in their staple length, which varies from 0·91 to 0·99 inches. In spinning quality, however, M4 is inferior to Sind-Sudhar. In 1940 the Indian Central Cotton Committee initiated a scheme to improve the staple length and spinning quality of existing cottons. From crosses between M4 and long staple Upland cottons, introduced from the United States, strains have been selected which show an increase in staple length of $\frac{1}{8}$ inch or more; the strains maintain the yield and ginning out-turn of M4. The strains are at present under extensive test.

Strains of Egyptian and Sea Island cottons (*G. barbadense*) have given low yields. Recently it has been found that these cottons flower and fruit in Sind at a time when the photosynthetic activity of the plant is very low, resulting in low yield. The possibility of obtaining hybrids combining the superior lint quality of *G. barbadense* with the high functional efficiency of the leaves of *G. hirsutum* at the fruiting stage is being investigated.

In order to obtain as wide a range as possible of long staple cottons belonging to *G. barbadense* and other species, the Indian Central Cotton Committee decided at their meeting in August, 1946 to send an expedition abroad to collect material for future breeding work on long staple cottons in India.

324. 633.51:576.16:582
633.51:581.9

HUTCHINSON, J. B.

Notes on the classification and distribution of genera related to *Gossypium*.

New Phytol. **1947** : **46** : 123–41.

Vavilov's theory that the areas in which the variability of cultivated species is greatest are those in which the species originated, is discussed, and it is suggested that this theory applies to wild as well as cultivated species. The argument for this is based on the conclusion of Hutchinson and Stephens on the variability of successful species.

The genera *Cienfugosia* and *Thespesia* are divided into species according to the principles of Vavilov and of Mayr, the criteria employed being geographical distribution and variability. A key is given for distinguishing the genera *Cienfugosia*, *Gossypioides*, *Gossypium*, *Thespesia*, *Kokia*, *Notoxylinon* and *Alyogyne*. *Cienfugosia*, *Gossypioides* and *Thespesia* are described in detail, species keys being included. There is evidence of genetic divergence unaccompanied by morphological differentiation in *G. Kirkii*. The generic characters of *Kokia*, *Notoxylinon* and *Alyogyne* are described and the two latter divided into species on the basis of Lewis's descriptions but a full treatment is not given owing to lack of material.

The relationships of the genera *Cienfugosia*, *Gossypioides*, *Gossypium*, *Thespesia* and *Kokia* are considered.

325. 633.51:576.354.4:575.127.2

AFZAL, M.,
SIKKA, S. M. and
AHSAN-UL-RAHMAN

Cytogenetic investigations in some *arboreum-anomalum* crosses.

Indian J. Genet. Pl. Breed. **1945** : **5** : 82–91.

Meiosis was studied in the following three F_1 hybrids between *Gossypium arboreum* var. *neglectum* f. *bengalensis* and *G. anomalum*: Jubilee x *G. anomalum*; Arboreum Red x *G. anomalum*; and Karunganni 1 x *G. anomalum*. The pollen mother cells of the different hybrids and also of each hybrid showed considerable variation in the extent of chromosome conjugation. Anomalous behaviour of the univalents and the formation of single and double chromatin bridges during anaphases I and II resulted in the formation of micronuclei and microcytes with varying chromosome numbers, and the hybrids were thus highly

sterile. Most of the seeds set were non-viable. About 1·5% of the seeds germinated; the plants derived from these had a chromosome number of $2n = 26$.
Back-crossing experiments were carried out on the hybrid Jubilee x *G. anomalum*. By back-crossing this hybrid twice to Jubilee and selecting for high boll number and seed setting in subsequent generations, fully fertile strains have been secured which possess completely white lint and which are superior to Jubilee in yield of seed cotton, ginning percentage, staple length and fineness of lint.
The value of *G. anomalum* in improving staple length and other characters in *G. arboreum* and *G. herbaceum* cottons is discussed, with reference to the colchicine technique of chromosome doubling to overcome the sterility of the cross *G. arboreum* x *G. anomalum*. In view of the results obtained by the authors, it is considered that the technique of recurrent back-crossing is more satisfactory.

326. SAEGER, H. DE 633.51:581.142:575.42
L'altération du pouvoir germinatif des graines de coton. (**The deterioration of the germinative capacity of cotton seeds**).
Bull. Agric. Congo belge 1946 : **37** : 598–607.

The non-germination or arrested germination of some of the seeds in cotton fields, especially those planted with variety 270, is discussed. It is thought that variety 270 has not a particularly low germinative capacity but that the sudden, general decrease in the latter coincided with the introduction of this variety purely by chance. Recommendations are put forward for dealing with the problem. These concern the selection of seeds for sowing the following year and the gathering, shelling, storing and sowing of them.

327. TER-AVANESJAN, D. V. 633.51:581.331.2
(**Fertilization of plants by a limited quantity of pollen**).
Agrobiologija (Agrobiology) 1946 : No. **3** : 71–77.

Emasculated flowers of the Upland cotton C–15 and the Egyptian 35–1 were pollinated with a limited number of pollen grains, up to 20 in number, so as to rule out the possibility of selective fertilization. Control flowers were emasculated and pollinated with an unlimited number of pollen grains. The experimental flowers formed from 8 to 15 seeds per boll, the seeds being smaller than those from the controls. Experimental and control seeds were sown in the same conditions. The plants arising from the seed from the same capsule of an experimental plant varied in type; in C–15 their yield of raw cotton varied from 82 to 510 grm. for instance, whereas the control plant varied only from 180 to 220 grm.; the lint length varied from 26·4 to 35 mm. in experimental plants and 31 to 31·4 mm. in controls. In 35–1 the weight of raw cotton varied from 110·2 to 306·6 grm. in experimental plants and from 156·7 to 180 grm. in controls.
The seed of these plants was sown and the F_2 from each individual plant examined. Transgressive segregation occurred, the variation being greater than in the controls; plants with values exceeding the maximum of the controls were observed in respect of number of bolls per plant, yield per plant, boll weight, lint length, lint percentage and plant height. The differences were preserved also in the F_3 generation. Similar results were obtained with other varieties though the figures are not reported.
An analogous experiment was carried out with *Hibiscus esculentus* L., using 65 pollen grains; the number of seeds per capsule obtained was 20 to 30, as against an ovule number of 60 to 80. The seeds were sown and again a greater variation was obtained in experimental than in control plants as regards number of capsules, number on main stem and on side stems, and height of plant.
Comparable results have been obtained with a number of other plants and the method is considered interesting both as a means of producing new forms of value in plant breeding and as illustrating Lysenko's principle of "shattered" inheritance.

328. AFZAL, M. 633.51:581.331.2:575.116.1.061.6
Problems in cotton improvement in the Punjab. II. Improvement of yield.
Indian Cott. Gr. Rev. 1947 : **1** : 151–57.

The problem of correct agronomic practices and other factors affecting cotton yield in the Punjab are discussed.

In referring to the improved yields that can be obtained as the result of breeding, mention is made of the observation that the character of non-dehiscent anthers is linked with the character of cream-coloured pollen. In the Punjab, effective flowering begins only at the beginning of September; all flowers set prior to this time are shed on account of the non-dehiscence of the anthers, with the result that no bottom crop is obtained. The attempt is therefore being made to incorporate the character of yellow pollen, associated with dehiscence of the anthers, in the cotton varieties grown in the Punjab.

329. 633.51:581.49:575.242
SIMPSON, D. M. 633.51:581.49:575.172.3:581.6
Fuzzy leaf in cotton and its association with short lint.
J. Hered. 1947 : **38** : 153–56.

A mutant with a dense pubescence on the external surfaces of the plant is reported in Upland cotton. The data obtained from crosses with this mutant and two inbred strains of Upland cotton possessing almost glabrous leaves showed that the mutant character is determined by a single gene which is allelic to the gene controlling the glabrous condition. The heterozygote exhibited a readily distinguishable intermediate pilosity. The mutant also possesses a very short fibre. The pilose character and short fibre have been found to be very closely associated, suggesting that both characters are due to the pleiotropic effects of a single gene.

330. LORD, E. 633.51:581.6
On the grade and staple of cotton.
Emp. Cott. Gr. Rev. 1947 : **24** : 186–96.

Information is given on the commercial classifications of grade and staple in use in the various cotton producing countries. The article is intended to be of general interest to breeders and growers.

331. SMITH, H. P. 633.51–1.556.5:575(73)
The production of cotton in the United States.
Emp. Cott. Gr. Rev. 1947 : **24** : 175–85.

The article includes a section on breeding cotton suitable for mechanical harvesting.

332. COTTON, J. R. 633.51–2.484–1.521.6:575.42
Improving wilt resistance and yield of cotton by roguing and selection.
Phytopathology 1947 : **37** : p. 432. (Abst.).

A strain with a low degree of wilt resistance, derived from the cross D. and P.L.-Dixie Triumph, was rogued and selected under conditions of severe wilt infection. Bulk seed was planted in 1941 and roguing effected at ten day intervals; the lint characters of 300 plants were studied, and from these 100 plants were selected for planting in 1942. The same procedure was repeated in the 1942 and 1943 seasons. In 1944, four strains were selected for increase and testing. Progeny No. 47–3–7–9 was graded the best in 1946, having a lint percentage of 37·7, boll size of 85 bolls per pound, and lint length of one inch. Progeny No. 33-2-9-10 ranked second, having a lint percentage of 39·7, boll size of 80 bolls per pound and lint length of 1 1/16 inch. Both strains showed at least 98% wilt resistance. The original strain had only 35% wilt resistance, a lint percentage of 35·9, boll size of 88 bolls per pound, and lint length of one inch.

333. SMITH, A. L. and 633.51–2.484–1.521.6:575.42
BALLARD, W. W.
Wilt resistance in Empire cotton.
Phytopathology 1947 : **37** : 436–37. (Abst.).

The original parent plant of Empire cotton was re-selected in 1935 from a field planting of Stoneville 2. Continuous selfing of Empire has been carried out. Selfed lines tested during the period 1944–46 have exhibited a wide range of reaction to wilt, varying from a high degree of susceptibility to resistance comparable with that of the best commercial varieties. This wide range in wilt resistance indicates the heterozygosity of the origina plant, and suggests its possible origin from a cross between Stoneville 2 and a wilt resistant

variety. The selfed lines show a desirable uniformity in agronomic characters; thus highly wilt resistant lines of Empire can be immediately produced.

334. P....., V. G. 633.51–2.7–1.521.6:575.127.2
Cotton boll-worm control by genes.
Indian Fmg 1947 : **8** : 89–90.
A discussion is given of the possibilities of breeding for boll-worm resistance in cotton by crossing the resistant wild species, *Gossypium Thurberi*, with Asiatic and American cottons.

335. Gaines, J. C. and 633.51–2.951.1
Dean, H. A.
New insecticides for boll weevil, bollworm and aphid control.
J. Econ. Ent. 1947 : **40** : 365–70.
Different cotton varieties were found to be infested with weevils and bollworms to different extents after receiving the same insecticide treatment. Calcium arsenate and benzene hexachloride reacted against the bollworm differently in varieties Lankart and Shafter Acala, and the different reactions affected the yields.

336. 633.52(56)
Esberk, T. 633.52:575(56)
Türk keten lifleri üzerinde etüdler. (**Studies on Turkish flax fibres**).
T.C. Ankara Yüksek Ziraat Enstitüsü, 1947 : No. 151 : Pp. 92.
This paper is a thesis, containing an extensive study of Turkish flaxes based on replies to questionnaires and on a tour by the author in many provinces of Turkey, during which samples from the 1938 and 1939 crops were collected.
The discussion ranges over the following subjects: the botanical classification of flaxes and the practical classification into oil and fibre types; the history of flax and linen in Turkey and the present position of the industry; Turkish varieties, the views of Žukovskiĭ, Vavilov and Ellâdin being considered; sowing, rotation and manuring; the production of seed and fibre and methods of processing; and laboratory investigations of Turkish flaxes. This last part of the work includes detailed morphological studies of the samples, and technological investigations of oil and fibre yields.
Interesting information on the manifold and unexpected uses to which the flaxes of Turkey are put in different parts of the country is also given. A typical fibre flax for summer cultivation is needed, and a summer intermediate type which could be grown early in the year is suggested to replace the winter flaxes which occupy the fields for a long time. Improvement of existing intermediate flaxes must be undertaken.

337. Jakuškin, I. V. and
Nikitina, I. L. (Editors) 633.52:575(47)
(**The breeding, variety testing and seed production of hemp, *Abutilon, Hibiscus*, and jute. Summaries of the plenary meeting of the section on technical crops, 20–24 March, 1938**).
Redakcionno-izdateljskiĭ Sektor Vsesojuznoĭ Akademii Seljsko-hozjaĭstvennyh Nauk imeni V.I. Lenina. (Published by the Editorial and publishing section of the Lenin Acad. Agric. Sci. U.S.S.R., Moscow) 1939 : Pp. 56.

Griško, N. N. [(*The present position and future of hemp breeding*)]. (*pp. 3–7*).

It is desired to eliminate the various differences between the male and female plants which make the maturing of hemp inconveniently long drawn-out. As a result of genetical investigations, it has been found that many disadvantages arising from the dioecious characters can be overcome by the following method of breeding. The male parent plants are selected from among predominantly female plants having some male flowers, and predominantly male plants having some female flowers. The female parent plants are selected from male plants bearing some female flowers.

Sizov, I. A. [(*The present position at the All-Union Institute of Plant Industry in regard to hemp breeding*)]. (*pp. 7–9*).

Caucasian, Cuban, Italian, Japanese, Western Chinese, various local Russian hemps, and wild hemps are being studied with a view to their utilization in the breeding of varieties suitable for cultivation in various parts of the U.S.S.R. Some of the types mentioned above are briefly described and compared, especially with reference to the time taken to mature, pests and diseases, height of stem, and flowering. Northern and southern types of hemp are briefly compared, particularly with regard to seed formation and the height of stem when plants of either type are grown under conditions natural to the others. The chief aim in hemp breeding is to produce monoecious varieties having a short period of maturing.

Anon. [(*The present position and the method of procedure in the trial of local and improved varieties of hemp*)]. (*pp. 10–21*).

It is necessary to decide which varieties are most suitable to each of the regions where hemp is grown or could be grown. The following considerations have been borne in mind during the course of the trials discussed in the present article: the yield, length and strength of fibre, and the yield of seed from the male and female plants of both local varieties and varieties produced by breeding, including the Italian and other types from southern latitudes; the length of the vegetative period; and various characters bearing on the best use of a particular variety in a given region, such as the characters deciding whether or not a variety can yield only fibre, or both fibre and seed.
A policy for the organization of variety trials is explained.

Nevinnyh, V. A. [(*The present and future position of breeding the new fibre crops "Hibiscus" and "Abutilon"*)]. (*pp. 22–27*).

The yields and lengths of the vegetative periods of several varieties of *Hibiscus* and *Abutilon*, and also the seed yields of *Abutilon* varieties, are compared. The original material for breeding *Hibiscus* came from Iran and Ferghana; the material for breeding *Abutilon* originated from Japan, Manchuria, China, and the far eastern U.S.S.R. The plants of both genera are largely self-pollinating. But in addition to individual plant selection within varieties of both crops hybridization between species of *Abutilon* is being practised. The production of élite seed is briefly described. The chief aims of breeding are as follows: varieties combining a short vegetative period with high yield, and able to be grown under various conditions; resistance to certain pests and diseases; the elimination of spines and hairs from *Hibiscus*; and an erect stem in *Abutilon* which will not become tangled before processing.

Manin, V. V. [(*A plan of seed production and replacement for the new fibre crops*)]. (*pp. 28–32*).

Most of the article deals with hemp; reference is also made to *Hibiscus* and *Abutilon*. An account is given of a policy of reorganization whereby the southern regions of seed production are to supply the central regions of the U.S.S.R. with good pure seed from which crops are to be grown for fibre only. The author deals briefly with the production of élite seed, its rapid propagation at various centres, and its introduction into regions where impure varieties resulting from unorganized seed production are being grown.
There is a possibility of establishing the seed production of *Abutilon* in the central and western parts of the Union, rendering these independent of the south.

Pereverzev, G. A. [(*The present position of research on jute and the possibility of extending its use in industry*)]. (*pp. 32–42*).

Experiments are described which show that *Corchorus capsularis* and *C. olitorius* can be grown in the U.S.S.R. as far north as latitude 43°, and produce seed. Investigations were

therefore carried out on the flowering, pollination, selection and breeding of jute with a view to producing varieties which are early, have tall unbranched stems, yield a high proportion of good fibre and ample quantities of seed, and which are resistant to pests and diseases.

Kaniskin, N. F. [(*Hemp breeding at the Lunino Experiment Station*)]. (*pp. 42–44*).

Since hemp breeding was begun at the Station in 1931, two varieties of southern hemp, Caucasian and Italian, and one central Russian hemp, Staro-oskoljsk, have been produced. These varieties are described and compared with a standard variety. The varieties are the first stage of the attempt to breed a southern variety which can mature in the vicinity of the Station, and an improved central Russian variety.

Medvedev, P. F. [(*The work of the All-Union Institute of Plant Industry on the breeding of "Abutilon" and "Hibiscus"*)]. (*pp. 44–46*).

Abutilon has been shown to be adapted to cultivation in the central and northern regions of the U.S.S.R. and not in the southern. Chinese and Manchurian specimens are therefore being drawn upon as material for the plant breeder. They provide good fibre; but cultivation in northern latitudes also requires earliness, which may have to be sought among wild specimens whose fibre is poor in quality.

The range of characters available for the breeding of *Hibiscus* is more limited, though it is thought that African material may overcome this deficiency.

Owing to the insufficiency of breeding material of both *Abutilon* and *Hibiscus*, individual plant selection within the species known to contain the most promising characters, rather than hybridization between species so far known to contain few or no characters of practical value, is likely to be the more general practice until the full range of material is more fully investigated than at present. I. Z.

338. GYÖRFFY, B. 633.52:581.04:576.356.5(43.91)
A polyploid-len nemesitése. (**Breeding of polyploid flax**).
Agrártudományi Szemle **1947** : **1** : 35–37.

The greater genetical stability of naturally occurring polyploids of flax in comparison with those induced by colchicine is pointed out. This superiority is considered to be due to the mutation and selection that have taken place during the course of time. To secure similar results, hybridization experiments were carried out using artificially induced polyploids. Hercules Concurrent and Hercules 041 showed improved fertility in successive generations. E. E.

339. 633.52–1.531.12–1.521.5(49.2)
Produktionen av linfrö i Holland för export. (**The production of flax seed in Holland for export**).
Lantmannen **1947** : **31** : 902–03.

In the last few decades much attention has been devoted in Holland to the improvement of the quality and yield of flax seed among other crops and linseed is now one of the country's most important exports.

Well planned cultivation has ensured that Holland possesses flax varieties suitable for varied requirements. The production of high grade seed has been based on extensive research carried out by the Nederlandsch Vlasinstituut [Dutch Flax Institute], the Instituut voor Rassenonderzoek [the Institute for Research on Crop varieties], and the Instituut voor Plantenveredeling [Institute for Plant Breeding], supported by many private growers.

In addition to the well known Concurrent, new varieties, e.g. Formosa, and the white flowered Hollandia and Percello are in great demand for their quality and yield.

The Instituut voor Rassenonderzoek exerts a regular control to ensure that the quality of the varieties entered in the Central Register is maintained, so that only approved seed is available for export.

340. 633.52–2.4:576.16:631.521.6:581.6:575(82)
KUGLER, W. F. 633.854.54–2.4:576.16:631.521.6:581.6:575(82)
El mejoramiento del lino oleaginoso y textil en la Argentina. (**The improvement of linseed and flax in Argentina**).
Rev. Fac. Agron. Univ. Montevideo 1947 : No. 44 : 29–67.

A comprehensive account is given of the breeding work done in Argentina, especially at Pergamino, on flax, beginning with an outline of the history of its introductio . The principal breeding objectives have been high yield, adaptability, earliness, disease resistance and superior oil and fibre.

With regard to resistance to *Fusarium Lini*, the most resistant types used have been the Russian form Mapúm M.A., the Polish form 407–4–3–2 and the hybrid H100. Much work has been done on varietal resistance to the races of *Melampsora Lini*. Bombay is immune to race 42, and when plants with this type of immunity are crossed with susceptible forms, a 3 : 1 segregation for immunity results. Selection 10678 2 is also immune to race 42, but the factor concerned is different from that of Bombay. The genes for resistance to races 22 and 40 are allelomorphic. Breeding for resistance to *Sphaerella Linorum* has proved difficult. A high degree of resistance is rarely encountered, and at present efforts are being made to utilize the rather low degree of resistance found in a few local varieties, in varieties C.I. 439 and C.I. 975 from North America, and in some lines isolated at La Estanzuela.

The Crema group of linseed varieties, probably introduced from the U.S.A., are noteworthy for their superior yield and the quality of their oil. Selection 407-4–3–2 has produced an outstanding fibre yield.

SUGAR PLANTS 633.6

341. MUNSON, E. P. 633.61(76.3)
Inspection report seed canes C.P. 34–92, C.P. 36–183 and C.P. 36–19.
Sug. Bull. N.O. 1947 : **25** : 169–70.

Tables give the results of the seed cane inspection of the new varieties C.P. 34–92, C.P. 36–19 and C.P. 36–183 (cf. Abst. 344). The tables include information on location, incidence of mosaic and chlorotic streak, varietal purity, stand and acreage.

342. EMMEREZ DE CHARMOY, D. D' 633.61:35:575(69.81)
Études des cannes interdites et agrées en sucrerie à Bourbon. (**Sugar canes prohibited and approved in the sugar industry in Bourbon**).
Rev. Agric. Réunion 1946 : **46** : 127–32, 163–70.

The choice of sugar cane varieties for growing in Réunion is discussed and the percentage of sugar for several varieties is tabulated. The administration of sugar production is discussed.

The author is of the opinion that too many varieties are used in Réunion and protests against the use of those which have not been adequately studied and have been obtained illicitly from the experimental station. The use of wild canes and of wrongly named varieties is also discussed.

The achievements of the station are summarized and the improvements it has effected are illustrated by facts concerning the prevalence of disease and the amount of production.

The distribution in other countries of varieties M–134/32, P.O.J. 36, P.O.J. 2878, Co. 281 and Co. 290 is given. The local industry has relied almost entirely on these five varieties for ten years but Co. 419, Co. 432, R. 331, R. 337 and another more recent series are now added.

343. YAMAZAKI, M. 633.61:575(52)
(**Breeding of sugar cane**).
Bot. and Zool. 1939 : **7** : 249–53.

In a brief introductory history of sugar cane breeding reference is made to work in Java, Hawaii and India and to Brandes' expedition to New Guinea and the discovery of *Saccharum robustum*. In Formosa also this new species is being used in breeding for improved types; and sugar cane-sorghum crosses are also being studied to obtain early varieties.

Since the Sugar Cane Research Station in Formosa was established in 1932, six varieties suitable for growing in Japan have been produced and one of them in particular, F108, has given a yield increase of at least 20% in various districts.
Some techniques for increasing tillering and regulation of flowering are mentioned and also the sulphurous acid treatment used to hasten hybridization. Work on colchicine is proceeding at the Station.

344. 633.61:575(73)
Release of new sugar cane varieties, C.P. 34–92, C.P. 36–19 and C.P. 36–183.
Sug. Bull. N.O. 1947 : 25 : 165–66.
The new varieties C.P. 34–92, C.P. 36–19 and C.P. 36–183 have been released co-operatively by the United States Department of Agriculture, the Louisiana State Agricultural Experiment Station and the American Sugar League (cf. Abst. 341).
C.P. 34–92 and C.P. 36–19 are suitable for mechanical harvesting; it is intended that they should replace moderately productive varieties such as C.P. 29–120 and C.P. 29–320, which are unadapted to such harvesting. C.P. 36–19 is similar to C.P. 29–120 in most of its agronomic and commercial characteristics. It is resistant to red rot, moderately susceptible to root rot, and occasionally shows a low incidence of mosaic; it is resistant to borer. C.P. 36–19 is recommended for light soils and the better drained mixed soils.
C.P. 34–92 has equalled C.P. 29–120 in yield of sugar per acre, but is 11% below this variety in yield of sugar per ton of cane. It therefore requires favourable ripening conditions. In milling qualities it is similar to C.P. 28–11. It is resistant to root rot, susceptible to red rot, and moderately resistant to borer attack; occasionally it shows a low percentage of mosaic infection.
C.P. 36–183 has generally equalled, and occasionally surpassed, C.P. 34–120 in yield of cane per acre and sugar per ton of cane. In milling grade it is superior to C.P. 34–120. It is moderately susceptible to red rot, and susceptible to root rot; it appears to be fairly resistant to mosaic. In borer susceptibility it is in approximately the same class as C.P. 29–103. It is not suitable for the mechanical harvesters at present in use.

345. 633.61:575(88)
Report on the sugar experiment stations for the year 1946.
Sug. Bull. Dep. Agric. Brit. Guiana 1947 : No. 15 : 41–48.
An account is given of the testing, multiplication and selection of seedlings which are in progress and of the crosses attempted in 1945. At the end of the year there were 50 variety tests in progress. The statistics for recent years on such matters as seedlings bred, and field experiments started and harvested, are tabulated.

346. Mangelsdorf, A. J. 633.61:575(96.9)
Sugar-cane breeding in Hawaii. Part I, 1778–1920.
Hawaii. Plant. Rec. 1946 : 50 : 141–60.
A well documented account is given of early sugar cane introduction and breeding work in Hawaii. The first recorded attempt at sugar cane breeding is to be found in a resolution passed by the Royal Hawaiian Agricultural Society at its first meeting in Honolulu, 1851, to appoint a committee for the purpose of organizing experiments to secure plants from the seed of native sugar canes. This pioneer attempt to secure seedlings met with failure. Breeding was begun in Hawaii in 1905, when success was obtained by the Experiment Station in germinating a large number of seedlings from the variety collection at Makiki. The numbers H1 to H399 were assigned to selected seedlings; among these seedlings H109 gradually grew in popularity among the growers. During the period 1906–12 only a few hundred new seedlings were propagated, attention being mainly given to the work of testing the seedling canes obtained in 1905. The establishment of the Waipio sub-station in 1912 provided additional facilities, and in the following year seedling propagation was resumed on a larger scale. Among the seedlings produced during this period may be mentioned H456, a seedling of H240, Kohala 107, a seedling of D1135, and the sister cane Kohala 202.

347. Brett, P. G. C. 633.61:578.08:575(68)
An investigation into sugarcane breeding in South Africa.
S. Afr. Sug. J. 1947 : **31** : 341–49.

Under South African conditions pollen production and seed setting in the sugar cane is generally low. Experiments have therefore been carried out on techniques likely to increase the scope of breeding, and on the factors affecting fertility and setting.
Satisfactory methods of preserving cut canes in acid solutions and of rooting cut canes are described.
The pollen of canes which had been kept under artificial conditions sometime before flowering was compared with that produced by canes left in the field. It was found that artificial conditions which included high temperature, high humidity and increased length of day resulted in increased pollen fertility. The experiments are to be continued.
Crosses carried out in the glasshouse were found to produce a larger number of seedlings than similar crosses in the field.
It is thought that rainfall conditions in December, January and February may have an important effect upon the amount of flowering in the following winter.
The various *Saccharum spontaneum* crosses made at the Natal Experiment Station and the number of seedlings secured are listed.

348. Evans, H. 633.61:581.6(69.82)
Propagation of the recently released varieties: M. 165/38, M. 63/39 and M. 76/39.
Rev. Agric. Maurice 1947 : **26** : p. 151.

In view of the limited knowledge of the characteristics of the sugar cane varieties M. 165/38, M. 63/39 and M. 76/39, growers are advised not to propagate them on a large scale as yet in Mauritius.

349. Knowles, W. H. C. 633.61–1.557(88)
The variety and fertilizer position of the sugar industry, XII.
Sug. Bull. Dep. Agric. Brit. Guiana 1947 : No. **15** : 33–40.

This paper includes a table showing the weighted mean yields of the canes harvested on the estates in 1946.

350. Christie, G. A. 633.61–2–1.521.6(94.3)
S.J.16 in the Burdekin area.
Cane Gr. Quart. Bull. 1947 : **10** : 161–62.

An account is given of the habit, susceptibility to disease and growth rate of the sugar cane variety S.J.16 in the Burdekin area of Queensland.

351. Emmerez de Charmoy, D. d' 633.61–2.484–1.521.6(69.81)
Une maladie nouvelle de la canne à sucre à l'Ile de la Réunion. L'apoplexie (*Cephalosporium Sacchari* Butl.). [**A new disease of the sugar cane in Réunion. Apoplexy (*C. Sacchari* Butl.)**].
Agron. Trop. 1947 : **2** : 369–74.

Work on the susceptibility of different sugar cane varieties to the attacks of *C. Sacchari* indicates that Uba Marot, Co–419, R–331, 334 and 337 are to be considered only slightly susceptible, and P.O.J. 2878, P.O.J. 2961 and Co–290 very susceptible.

352. Volp, P. 633.61–2.7–1.521.6(94.3)
Varietal resistance to greyback grubs in the Mulgrave area.
Cane Gr. Quart. Bull. 1947 : **10** : 176–77.

The advantages of vigorous rooting sugar cane varieties in resisting damage by the larvae of the greyback beetle are discussed. Details are given of the types of root system and reactions to attacks, of eight varieties on the approved list in the Mulgrave area.

353. Wiehe, P. O. 633.61–2.8–1.521.6
La mortalité des boutures de canne à la plantation. (**The mortality of sugar cane cuttings in the plantation**).
Rev. Agric. Maurice 1947 : **26** : 138–45.

An account is given of the resistance of different sugar cane varieties to ananas and chlorotic streak.

354. Caminha Filho, A. 633.61–2.8–1.521.6(81)
A cana de açúcar na Bahia. (**The sugar cane in Bahia**).
Bol. Inst. Cent. Fom. Econ. Bahia 1944 : No. 15 : Pp. 119.
Descriptions are included of the sugar cane varieties grown in Bahia, Brazil, and of their reaction to mosaic.

355. Foster, C. B. 633.61.00.14(72.9)
The yield of sugar cane in Barbados in 1942.
Bull. Dep. Sci. Agric. Barbados 1946 : No. 8 : (N.S.) Pp. 16.
The plant cane and ratoon yields are given in tons per acre for different sugar cane varieties of the low, intermediate and high rainfall areas of Barbados. In the low rainfall areas, the new seedling B.37161 was outstanding for its high yield as plant cane. The acreage, percentage acreage and total tonnage of the different varieties are also given.

356. Foster, C. B. 633.61.00.14(72.9)
The yield of sugar cane in Barbados in 1946.
Bull. Dep. Sci. Agric. Barbados 1946 : No. 9 : (N.S.) Pp. 14.
The plant cane and ratoon yields are given in tons per acre for different sugar cane varieties of the low, intermediate and high rainfall areas of Barbados. The acreage, percentage acreage and total tonnage of the different varieties are also given.

357. Williams, C. H. B.,
Knowles, W. H. C. and
Cameron, C. 633.61.00.14(88)
Field experiments with sugar cane, XV.
Sug. Bull. Dep. Agric. Brit. Guiana 1947 : No. 15 : 1–32.
An account is given of the results of 46 variety trials carried out on material harvested in 1946. These results largely confirm those obtained in 1945 with regard to the leading varieties, and no outstanding seedling is recommended, this year, for commercial extension. D.200/36, however, merits small scale planting in view of its possible importance as a cane suitable for mechanical harvesting, whilst seedling D.26/39 might well be established and observed on a nursery basis, with a view to its extension on the Pegassy clay soils.

358. Decoux, L. 633.63:575(49.3)
Cinquante ans de progrès dans la culture de la betterave sucrière en Belgique. (**Fifty years' progress in the cultivation of the sugar beet in Belgium**).
Publ. Inst. Belge Amélior. Better. 1946 : **14** : 153–69.
An account is given of the ways in which the sugar beet has been improved during the years 1895–1945 in Belgium, and the principal research carried out on sugar beet during this period is reviewed. The author hopes for its further improvement by work on two new aspects, firstly, by new methods affording important new selections, and secondly, by the application of mechanization.

359. Doxtator, C. W. and 633.63:575.125
Skuderna, A. W. 633.63–2.484–1.521.6:581.6
Crossing experiments in sugar beet lines.
Proc. Amer. Soc. Sug. Beet Technol. 1946 (1947) : 230–36.
Root selection for leaf spot resistance and high sucrose percentage were made from an élite stock of American No. 1 known as 8–406–0. These were set out for seed production, and 125 plants were harvested separately as mother lines for field tests. The most promising of the progeny were then selected for greenhouse crossing work and all possible crosses made between them. The results of tests on hybrids, parent lines and check varieties indicate an appreciable amount of heterosis in the hybrids. The average sugar per acre yield of the hybrids was greater than that of the parents, and, despite this, their sucrose percentage was not depressed. Hybrid 26 x 35 gave the best yield in both 1942 and 1943. Correlation tests showed that high yielding parent lines usually, but not always, gave high yielding progeny. The only improvement over the parent variety of the selected mother lines was in sucrose percentage, and was due mainly to selection of lines more resistant to leaf spot.

360. Stewart, D.,
Gaskill, J. O. and
Coons, G. H. 633.63:575.125
Heterosis in sugar beet single crosses.
Proc. Amer. Soc. Sug. Beet Technol. 1946 (1947) : 210–22.

The root yield, sucrose percentage, and sugar production of 35 sugar beet hybrids, obtained by crossing 11 inbred strains and one open-pollinated variety with U.S. 215, U.S. 216 and Synthetic Check as male parents, are reported. Conditions were such that leaf spot was not a factor. The inbred strain gave relatively high yields. On the whole, the hybrids were superior to the parents though few of them significantly exceeded the averages of the parents or Synthetic Check in the attributes measured. The data are interpreted as evidence that heterosis occurs in sugar beets.

361. Sedlmayr, K. 633.63:575.14(43.91)
A beltenyésztés a cukorrépanemesítés szolgálatában. (**Inbreeding of sugar beet**).
Agrártudományi Szemle 1947 : **1** : 15–22.

The past history of sugar beet improvement is reviewed.
Inbreeding is discussed in detail. This method leads to the production of homozygous plants, and is thus considered as a means of hastening the selection of useful genes. Natural self-pollination under conditions of spatial isolation was used. Molino isolators were found to be unsatisfactory. Strains C 242 and Y 19 were found to be good self-pollinators; these two strains were obtained by inbreeding and laboratory methods.
The advantages as well as the dangers of inbreeding are pointed out. E. E.

362. Ernould, L. 633.63:576.356.5
L'autopolyploidie expérimentale chez la betterave. (**Experimentally induced autopolyploidy in the sugar beet**).
Publ. Inst. Belge Amélior Better. 1946 : **14** : 205–69.

The various methods used for the artificial production of autopolyploids and the results obtained by different authors are described. An account is given of the effects of colchicine treatment on plant cells.
Lists of species in which polyploidy has been induced by colchicine treatment and of fertile amphidiploid species obtained by doubling the chromosome number of the sterile hybrids are given, with references.
Colchicine has been found to be effective on plants other than angiosperms, and the results of experiments on ferns, bryophytes, algae, fungi, bacteria and protozoa are summarized.
Facts about the morphology, physiology and fertility of artificially induced polyploids are presented, and their application to sugar beet cultivation discussed.
The author describes his cytological technique for recognizing polyploidy, and his methods of inducing polyploidy with colchicine.
Polyploids of *Beta vulgaris* and *B. patellaris* were obtained by him. The triploids were larger than the diploids, but their sugar yield was not significantly different. The tetraploids were very much like the diploids. Seeds were produced by the tetraploids of both *B. vulgaris* and *B. patellaris* and those of the former gave rise to further tetraploids. The data obtained were insufficient to lead to a definite conclusion about the agricultural value of tetraploids, but it was observed that there is little difference between tetraploids and diploids as regards weight and sugar content, and that the tetraploids are less fertile, more susceptible to fungous diseases of the leaves and less liable to bolt than diploids.

363. Stewart, D. 633.63:581.162.32
Insects as a minor factor in cross pollination of sugar beets.
Proc. Amer. Soc. Sug. Beet Technol. 1946 (1947) : 256–58.

An account is given of experiments designed to evaluate the relative importance of wind and insects as pollinating agents of sugar beets. It is concluded that the role of the larger insects is not essential and that wind alone is an efficient agent. The part played by small insects is not taken into account.

364. WIKLUND, O. 633.63:581.192
Kemien och sockerindustrien. (**Chemistry and the sugar industry**).
Svenska Sockerfabriks Aktiebolagets Skrifter **1947** : **3** : 71–82.
"According to the author, chemical research can play a primary part in the development of the beet-sugar industry by widening our knowledge of those processes by which sugar is formed in the beet. Knowledge of this kind would increase the possibilities of influencing the processes in the desired direction. Such research, for which bio-chemists of the highest competence are required, would be a natural continuation of earlier, successful investigations into the composition of the sugar-beet. This research is the more necessary because experience shows that the purely technical results obtained in the sugar factories are fundamentally influenced by the constitution of the beet". [Author's summary].

365. ČERNÝ, M. 633.63:581.43:575.42(43.7)
Studie über die Komponenten des Rübenmarks. Rübensamenzuchtstation in Semtschitz. (**Study on the components of the beet pith. Experiment station for Beet Seed Growing in Semtschitz**).
Z. Zuckerindustr. čsl. Repub. **1942** : **65** : 149–54.
Seed growing stations are paying increasing attention to the pith of sugar beet varieties for selection purposes. The nature of the pith determines the woody character of the sugar beet. This study attempts to define the nature of the pith and to discuss methods for its analysis. The analyses were carried out on three sets of beet referred to as "population" beets, woody beets and non-woody beets. E. M. F.

366. BREWBAKER, H. E.,
WOOD, R. R. and
BUSH, H. L. 633.63:581.46:575
Single-germ seed.
Proc. Amer. Soc. Sug. Beet Technol. **1946** (1947) : 259–62.
Progress towards the isolation of a hereditary one-seeded ball character in sugar beets and its possible mode of inheritance are discussed.

367. DECOUX, L.,
VANDERWAEREN, J.,
SIMON, M. and
VAN GOIDSENHOVEN, W. 633.63:581.6(49.3)
Les variétés de betterave sucrière en Belgique, de 1940 à 1944. (**Sugar beet varieties in Belgium from 1940 to 1944**).
Publ. Inst. Belge Amélior. Better. **1945** : **13** : 413–54.
Each year from 1940 to 1944, comparative tests of a number of sugar beet varieties have been made. Nineteen varieties which were included in all the annual experiments are grouped according to sugar yield per ha. The fact that the difference between the first and last varieties is 951 kg. per ha. or 12·5%, illustrates the importance of choosing good varieties. For early sowings, Etoile de Svalöf [Svalöf Star] 015 (= E), Hilleshög, Zwaanesse I and Kuhn P give the best guarantees of resistance to bolting. Maribo Z, Schreiber S. S. II (= N), Maribo N, Hilleshög, Strube E and Dippe E have the purest juice.

368. ABEGG, F. A.,
STEWART, D. and
COONS, G. H. 633.63:581.6:576.356.5
Further studies on sugar beet autotetraploids.
Proc. Amer. Soc. Sug. Beet Technol. **1946** (1947) : 223–29.
Tetraploid sugar beets were compared with the corresponding diploids with respect to sugar production, root yield, sucrose percentage, bolting tendency and number of true seeds per ball. In general, the tetraploids were vegetative types which matured late and did not show an increase in sugar production as compared with the diploids. Their bolting tendency, however, was less than that of the diploids. All the tetraploids produced less viable seeds per seed ball than the diploids, most of the tetraploid seed balls containing only one viable seed. It is suggested therefore that tetraploid seed could be used without previous processing in mechanized operations. The data are not regarded as indicating that the production of high yielding tetraploids is unlikely.

369. CORMANY, C. E. 633.63–1.531.12:575
Bolting performance of sugar beet breeding stocks.
Proc. Amer. Soc. Sug. Beet Technol. 1946 (1947) : 197–98.
An account is given of breeding for seed producing ability at Sheridan, Wyoming.

370. DEMING, G. W. 633.63–1.557:575
A comparison of selected and random advanced generations of hybrid beet strain 520.
Proc. Amer. Soc. Sug. Beet Technol. 1946 (1947) : 191–96.
Since 1939 further generations have been bred from hybrid 520, a third generation beet hybrid, and the progeny subjected to yield trials. The variety was advanced to the seventh generation by continuous selection, and to the sixth by random increase. The results admit of no conclusion as to the progressive improvement or deterioration of the 520 strain by either method of breeding. It was found that commercial production of third generation seed was impracticable.

371. POWERS, L. 633.63–2–1.521.6(73)
Sugar beet varietal trials in the San Joaquin, Sacramento and Salinas Valleys of California.
Proc. Amer. Soc. Sug. Beet Technol. 1946 (1947) : 199–205.
The results of sugar beet variety trials carried out from 1939 to 1944 in the San Joaquin, Sacramento and Salinas Valleys are reported. The data show that the varieties grown in these areas fall into three main groups, those with high resistance to the virus causing curly top, those with moderate resistance of the organism causing downy mildew, and those with resistance to the conditions causing bolting. Varieties U.S. 22, U.S. 33 and Improved U.S. 33 are included in the first group, and U.S. 15 and Old Type (R and G) in the second. The factors to be taken into account in future breeding work are discussed.

372. HENDERSON, R. W. and
BOCKSTAHLER, H. W. 633.63–2.411.2–1.521.6
Reaction of sugar beet strains to *Aphanomyces cochlioides*.
Proc. Amer. Soc. Sug. Beet Technol. 1946 (1947) : 237–45.
Previous work on the effects of the fungus, *A. cochlioides*, on different sugar beet varieties and their hybrids is reviewed, and further field and greenhouse tests are described. These showed that U.S. 216 was moderately resistant under field conditions and S.P. 1–9–00 very susceptible. Of 216 progenies of selected mother beets, 152 had a higher survival rate than U.S. 216, while 70 exceeded this variety and 61 equalled it in vigour of top growth. A number of inbred lines and crosses between them were studied in replicated field experiments in heavily infested and in lightly infested soils. In general, the yield from crosses between resistant inbreds was significantly greater than that from crosses between susceptible inbreds.
In preliminary greenhouse experiments, the results for three strains corresponded to the field results.

373. COONS, G. H. ET AL. 633.63–2.484–1.521.6:575
Report on tests in 1945 of U.S. 215 × 216 and other varieties from sugar beet leaf-spot-resistance breeding investigations of the U.S. Department of Agriculture.
Proc. Amer. Soc. Sug. Beet Technol. 1946 (1947) : 206–09.
An account is given of tests conducted in 1945 of the first and third releases of U.S. 215 x 216 and other varieties obtained in the federal breeding project for resistance to leaf spot (*Cercospora beticola*). All three releases of U.S. 215 x 216 show high resistance to leaf spot, especially U.S. 215 x 216:3 which is definitely a sugar type in comparison with the parent variety. Synthetic Check (SP 4 5 0), in 1945, a year without serious and general spot attack, gave a greater average sugar production than U.S. 215 x 216. The necessity for breeding for specific adaptation and combining of desirable factors is pointed out.

374. 633.63–2.484–1.521.6:575
DEWEY, S. 633.63–2.8–1.521.6:575
Combination of *Cercospora* leaf-spot resistance and curly-top resistance in sugar-beet varieties.
Phytopathology 1947 : **37** : p. 441. (Abst.).

The leaf-spot resistant U.S. 216 sugar-beet, which is highly susceptible to curly-top, was crossed with the S.L. 611, U.S. 12, and U.S. 22/1 varieties; the latter are mass-selected varieties resistant to curly-top but extremely susceptible to leaf-spot. The F_1 generations were then crossed with U.S. 22/1. Selection for leaf-spot resistance was carried out in these crosses and in the progeny of the selected plants. When tested in 1946, selections S.P. 3–6–0 and S.P. 456–0 were highly resistant to both leaf-spot and curly-top.

375. OWEN, F. V.,
MURPHY, A. M. and
RYSER, G. K. 633.63–2.8–1.521.6:581.162.5:575.12
Inbred lines from curly-top-resistant varieties of sugar beets.
Proc. Amer. Soc. Sug. Beet Technol. 1946 (1947) : 246–52.

Self fertility and male sterility in sugar beets are briefly discussed with reference to the breeding of curly top resistant varieties. Hybridization of inbred lines gives increased vigour and greater uniformity than can be achieved by mass selection. The hydrid population S.L. 4108 from a cross between the male sterile strain S.L. 1–121 and the self fertile line CT9 gave 12% more sugar per acre than the average of seven mass selected varieties and it is expected that even better curly top resistant hybrids will be produced. The use of inbred lines has also led to the production of lines with other desirable characters such as resistance to petiole and crown-rot disease and greater resistance to bolting, and there are indications that lines with bilocular seed balls can be developed.
The very high degree of curly top resistance now available in the S_3 generation of line CT9 opens up the possibility of using it or its male sterile equivalent for hybridizing with non-resistant varieties which have other desirable qualities.

376. DECOUX, L.,
SIMON, M.,
MICHIELS, A. and
WAUTHY, R. 633.63.00.14(49.3)
Les variétés de betterave sucrière en Belgique de 1941 à 1945. (**Sugar-beet varieties in Belgium from 1941 to 1945**).
Publ. Inst. Belge Amélior. Better. 1946 : **14** : 170–82.

Each year a number of varieties have been tested for sugar yield and other characters. Seventeen varieties which were included in all the annual experiments are grouped according to yield. The fact that the difference between the first and last varieties is ·885 kg. per ha. or 10·6% illustrates the importance of choosing good varieties. For early sowing the varieties Hilleshög, Etoile de Svalöf [Svalöf Star] 015 (= E), X, and Klein-Wanzleben N show the greatest resistance to bolting. Maribo Z, Hilleshög, Strube E, Schreiber S.S. II (= N) and Maribo N have the purest juice.

377. WIMMER, G. 633.63.00.14:578.08
Kurzfristige Feststellung der wertbestimmenden Eigenschaften von Zuckerrübensorten mit Hilfe von Gefässversuchen. (**Rapid determination of the important characteristics of sugar beet varieties using pot experiments**).
J. Landw. 1943 : **89** : 188–95.

A sand culture technique is described for comparing the maturation time, total yield, sugar content, sugar yield and water requirements of different sugar-beet varieties.

378. RIBEIRO FILHO, J. 633.682(81)
Cultura e utilização da mandioca. (**Cultivation and utilization of manioc**).
Ceres, Brasil 1946 : **7** : 88–100.

An account is included of Brazilian varieties. These are classified into two groups,

mandioca brava and mandioca mansa. A detailed description is given of the brava variety, Guiada, and the two mansa varieties Pão do Chile [Chilean Bread] and 25.

379. 633.682–2.8–1.521.6:575.12(67.8)

Report of the East African Agricultural Research Institute, Amani, for the year 1946 (1947) : Colon. No. 213 : Pp. 16.

The programme of cassava hybridization and selection was continued (*Plant Breeding Abstracts*, Vol. XVII, Absts 996 and 1368.)

Seedlings of interspecific second back-crosses involving hybridization between cassava, "tree" cassava, ceara and *Manihot dichotoma* were obtained; about 400 seedlings of intervarietal cassava crosses were also secured. At the Sisal Experiment Station, Mlingano, 180 cassava clones were tested for their reaction to mosaic and brown streak; seven clones showed resistance to mosaic, and 47 were free from brown streak disease; two ceara hybrids and three *M. dichotoma* clones remained free from both diseases. Further back-crossing of virus resistant clones is necessary to restore full tuberosity of the roots. The highest yield of edible root so far obtained has been produced by a second back-cross ceara hybrid, which gave an average of 70 lbs. of fresh root per plant after 18 months' growth.

380. Satyanarayana Rao, N. 633.689:576.312.35

A note on the chromosome number of *Colocasia antiquorum* Schott.

Curr. Sci. 1947 : **16** : p. 229.

The somatic chromosome number of a local variety of *C. antiquorum* is reported to be $2n = 36$. The chromosomes tended to be arranged in pairs, suggesting that the variety is an autopolyploid. Chromosome numbers of $2n = 42$ and 28 have been reported by other investigators. It is suggested that the basic number of the species is $x = 6$, and that in these cases the material tested consisted of a higher polyploid variety and of aneuploids.

STIMULANTS 633.7

381. 633.71:575(52)

Tobacco cultivation in Japan.

British Intelligence Objectives Sub-committee, London 1946 : Report No. B.I.O.S./J.A.P./P.R./846 : Pp. 33. (Mimeographed).

The report outlines the work carried out at the Experimental Tobacco Farm of Monopoly Bureau, Kanagawa-Ken. Experience in the cultivation of tobacco in Japan has been similar to that in Australia. Various types of Virginian seed were imported, and attempts have been made to cultivate and cure leaf in Japan. As in Australia, the leaf produced is much inferior to that produced in the United States of America from the same seed. Reference is made to the following investigations which are of interest to breeders:—

In varietal trials conducted during the period 1938-40, the Odaruma x Bright Yellow No. 17, Harrison Pryor, Genuine Yellow Pryor, and the F_1 hybrid Harrison Pryor x Cash tobaccos were found to possess good colour and lustre. Harrison Pryor proved to be a productive variety.

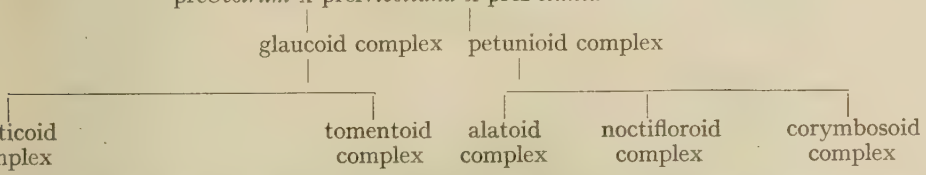
In tests held during the period 1941–43, 25 varieties of flue-cured tobacco were studied with regard to growth and yield. The following varieties were found to be superior to Bright Yellow: Genuine Yellow Pryor, Improved Waru, Davis Special, Moorfield Franagan, Bonanza, Gold Dollar, Hickory Prior and Bright Yellow and Yellow Mammoth. In the period 1938-44, Hatano x Odaruma, Bright Yellow x Yellow Mammoth, Awa x White Burley, Banangan and the Nakano tobaccos were distributed to planters to be included in comparative tests under practical conditions. Hatano x Odaruma and Bonanza gave the highest yields, followed by Davis Special, Moorfield Franagan and Awa x White Burley.

Varieties were crossed during the period 1935–43 with the purpose of securing a superior F_1 hybrid. The following three F_1 hybrids were investigated: Hatano x Odaruma, Odaruma x Bright Yellow and Awa x White Burley. Intravarietal selection of several varieties was carried out.

Attempts were also made to select superior varieties from intervarietal hybrids of domestic tobaccos and of flue-cured tobaccos, such as Hatano x Odaruma and Bright Yellow x

Maryland Broadleaf. Among the local tobaccos Selection No. 4 of the cross Hatano x Odaruma was the most satisfactory with regard to leaf shape, quality and yield. Two promising selections of flue-cured tobacco were also secured.
The colchicine technique was applied to Nanbuba, Nanbu leaf, Kuroba and other varieties with a view to obtaining tobaccos rich in alkaloid.
Breeding for resistance to bacterial wilt, black shank and common mosaic is reported. An F_3 selection from the cross Hatano x Awa showed the highest degree of black shank resistance. Some selections of Bright Yellow x Ambalema exhibited freedom from common mosaic infection.
Various physiological investigations are reported, such as experiments on the physiology of early maturity and the effect of temperature on seedling growth.

382. 633.71:576.16
GOODSPEED, T. H. 633.71:576.312.35
On the evolution of the genus *Nicotiana*.
Proc. Nat. Acad. Sci. Wash. 1947 : **33** : 158–71.
A description is given of the course of evolution believed to have been taken by the species of *Nicotiana*. The basic phylogenetic relationship between the species may be represented as follows:



This simple dendroid scheme is complicated however by several cases of hybridization between species from the different complexes.
The pregeneric complexes are thought to have had $2n = 12$ chromosomes, whence by allopolyploidy and autopolyploidy, series arose with $2n = 24$ and $2n = 48$ chromosomes. Aneuploid series could then have arisen from the euploids by further hybridization, sesquidiploidy, addition through fragmentation, or reduction by loss or fusion.
An account is given of the chromosomal configurations of the various species, the meiotic behaviour of the species and their interspecific hybrids, and the bearing of these observations on inferences as to the course of phylogeny in the genus.

383. FARDY, A. and 633.71:576.356.5:581.4
HITIER, H. 633.71:581.162.5:575.129
Expèces tétraploïdes et hybrides interspécifiques amphidiploïdes et triples diploïdes de *Nicotiana*, obtenus par l'action de la colchicine. **(Tetraploid species and amphidiploid interspecific hybrids and triple diploid hybrids of *Nicotiana* obtained by the action of colchicine).**
Mém. Serv. Exploit. Industr. Tabacs Allumettes 1945 : **1** : Sér. B : 1–117.
The practical uses of induced polyploidy in agricultural plants, fruit trees and tobacco are discussed.
Lists of the 16 tetraploids, 14 amphidiploid hybrids and two triple hybrids with duplicated chromosome sets made by the authors are given, together with their chromosome numbers. The morphology, meiosis and fertility of all these are described. Meiotic irregularities leading to reduced fertility are recorded for the tetraploid species, and their causes discussed in the light of observations of metaphase I in the corresponding haploids and diploids. It is concluded that they are due to partial homology between the chromosomes within each set, as well as to the presence of four of each type of chromosome in the nucleus. The morphology of the tetraploids is compared with that of the diploids and their fertility is shown to be very much reduced. Their leaves are often small and mis-shapen and this detracts from the practical value of *N. Tabacum* and *N. rustica* varieties. The probability

of eventually obtaining stabilized tetraploids by selection, and the kind of species which are most likely to give rise to these are discussed.
All the normal hybrids made by the authors show meiotic irregularities resulting from structural dissimilarity of the parent genomes. Their flowers are more plentiful, but they are completely sterile. Morphologically they are, on the whole, intermediate between the parents, but some are bigger than either parent. The corresponding amphidiploids differ in their floral characters. They are all fertile but to varying degrees. The fruits always contain less seeds than those of the parents. At metaphase I, autosyndetic pairing results in the formation of bivalents and the regular distribution of chromosomes giving balanced gametes in some hybrids, but in others there are slight irregularities leading to the production of slightly unbalanced gametes, and therefore to variation in the progeny as shown in the F_2 and F_3 of the amphidiploid *N. Tabacum* x *N. sylvestris*. The amphidiploids *N. suaveolens* x *N. glutinosa* and *N. glutinosa* x *N. sylvestris* are quite stable and act as new species.
Two triple hybrids (*N. glutinosa* x *N. sylvestris*) x *N. Tabacum* and (*N. Tabacum* x *N. glutinosa*) x *N. glauca* were made by crossing the amphidiploids of the first two species in each case respectively with a third species so as to obtain plants with chromosome sets from three different species. The chromosome numbers were then doubled with colchicine. These forms proved to be more fertile than the untreated triple haploids, but their meiosis shows irregularities resulting from allosyndetic pairing between chromosomes of different sets, and from instability in the genetic environment.

384. Smith, T. E. 633.71–2–1.521.6:575(75.6)
Hereditary defects in the T.I. 448A tobacco and its hybrids.
Phytopathology **1947 : 37** : 424–26.

Susceptibilities to three diseases have been observed in the wilt resistant T.I. 448A tobacco, a collection from Colombia, and its hybrids (*cf. Plant Breeding Abstracts*, Vol. XVI, Abst. 382). Two hybrid lines involving T.I. 448A in their parentage which were sown in a farmer's seed bed in North Carolina, exhibited symptoms of seedling blight caused by *Olpidium Brassicae* (Wor.) Dang. (*Asterocystis radicis* de Wild.). The disease was not recorded in other wilt resistant tobaccos.
A root disease of unknown cause was observed at the Tobacco Branch Station, Oxford, North Carolina. All single plant selections of T.I. 448A were susceptible; flue-cured varieties were resistant under all conditions. The F_1 of crosses between flue-cured tobacco and T.I. 448A grew normally, indicating the dominance of resistance.
An F_2 generation of crosses of T.I. 448A with flue-cured varieties showed 2·24% of plants with a leaf spot disease in a population of 1518. The cause is unknown. The behaviour of the F_1 hybrids between susceptible and normal genotypes indicated that resistance was dominant.

385. Laumont, P.,
Rodde, A. and
Rollin, L. 633.71.00.14(65)
L'expérimentation sur tabac à la station expérimentale d'Isserville au cours des campagnes 1943 et 1944. (**Experiments on tobacco at the Isserville experimental station in 1943 and 1944**).
Ann. Inst. Agric. Serv. Recherches Exp. Agric. Algérie **1946 : 3** : 64–114.

Yield data for the tobacco varieties, Spada, Chebli, Colon, Djendel, Cabot and Java-Isère are presented. They show that the selection Spada 11–15 is commercially superior to the rest.

386. 633.72:575(54)
Annual report of the Indian Tea Association, Tocklai Experimental Station 1946 : Pp. 25.

The tea breeding programme has been continued.
Seedlings and clones of highly drought resistant plants of the China type, collected in the United Provinces, are not likely to be of immediate commercial value but may prove useful in breeding. "Wild" tea and other species of *Camellia* related to tea have been collected in the Khasi and Patkoi Hills; interspecific crosses are to be studied.

The bulked leaf of the F_1 progeny in the Japvo breeding scheme has not shown a diminution in quality and strength of the manufactured product in comparison with the parental leaf. F_1 plants of the Gaurisankar scheme have been planted in the nurseries.
It has been found that if internode cuttings are allowed to remain in the soil in the propagating sheds for a period of two to eight weeks, they may then be removed from contact with the soil and are able to pass through a considerable degree of desiccation without detriment to subsequent rooting capacity. At this stage of removal from soil contact no roots have been developed. The practical importance of this result is discussed.
Investigations on leaf colour have indicated that a significant statistical relationship exists between the shade of a given leaf colour and the quality of the manufactured product; the colour of the leaf was judged on young plucked leaf. It is emphasized that the relationship is a generalized one, and that in the selection of the individual plant the only possible criterion of quality is the taste of the manufactured tea.
It has also been noted that the kind of leaf colour, and the relationship between the tone of the young leaf and that of the mature leaf on the same plant, also vary.
Quality has been shown to be related to subspecific type. Leaf colour bears a general relation to subspecific type, but seriation based solely on the basis of leaf colour does not correspond with that based primarily on subspecific taxonomic characters.
The inter-relationships between colour and tone, between the tone of young and old leaf, colour and subspecific type, and the range of variation of quality within one colour class are to be further studied.

387. Carvalho, A. and
Krug, C. A. 633.73:575.247
Genética de *Coffea*. IX. Observações preliminares sôbre quimeras genéticas em *Coffea arabica* L. **(Genetics of *Coffea*. IX. Preliminary observations on genetic chimaeras in *C. arabica* L.).**
Bragantia São Paulo 1946 : **6** : 239–50.

The genes *na na* condition the phenotype of var. *nana*, *Na na* of variety Murta, and *Na Na* of variety Bourbon. Somatic mutations of *na na* to *Na na*, and of *Na na* to *Na Na* are described.

388. Krug, C. A. and
Carvalho, A. 633.73:581.466:575.11
Genética de *Coffea*. X—Hereditariedade da ocorrência de sépalas desenvolvidas nas flores de *Coffea arabica* L. var. *goiaba* Taschdjian. **(Genetics of *Coffea*. X. Heredity of the occurrence of well-developed sepals in the flowers of *C. arabica* L. var. *goiaba* Taschdjian).**
Bragantia São Paulo 1946 : **6** : 251–63.

The well-developed foliaceous sepals of *C. arabica* var. *Goiaba* are determined by the gene *sd* in the homozygous condition. Foliaceous sepals are regarded as primitive in the Ixoreae. The normal allelomorphic gene *Sd* is only incompletely dominant. Modifying genes affect the expression of *sd*, especially when heterozygous.

389. Thorold, C. A. 633.73–1.557:519.24:581.6(67.62)
A study of yields, preparation out-turns, and quality in *Arabica* coffee. Pt. II. Preparation out-turns and quality.
Emp. J. Exp. Agric. 1947 : **15** : 167–76.

In a previous paper the author reported a study of variability in the yield of *Coffea arabica* trees and discussed the factors that should be considered in crop recording experiments (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1470). The present paper analyses the quantitative relationships between the fresh coffee and the final product, with a view to correct understanding of data on natural yields. An analysis is given of the following: (1) variation in the out-turn ratios associated with differences between the pickings of the same tree in one season, differences between the pickings obtained from the same tree in different seasons, and differences between the pickings of individual trees; (2) variation in the "A" grade of beans in relation to high and low yield; (3) variation in the size and weight

of the beans and its effect upon percentage hulling loss; and (4) variation in the quality of the raw and roast coffee in relation to various bean measurements, crop and out-turn data. "Cup" tests were not carried out.
From the study of preparation out-turns it was concluded that an accurate factor for converting fresh weight to final product cannot be obtained, on account of the great variation in cherry/parchment and cherry/clean ratios for the same tree throughout a single picking season and in different seasons. Such conversions should therefore be carried out by the use of simple and arbitrary factors.
The appearance of the roast coffee was the only factor which showed a variation between trees outweighing that due to the effect of season.
The only high correlation obtained for both the quality of the raw and roast product was their positive correlation with the number of beans in 1 oz. of clean coffee. It was also noted that the better roast products were given by trees grown in natural shade.
The bronze tipped and narrow-leaf type which has been recommended for its resistance to the Elgon dieback disease did not appear to be inferior in quality to other types of coffee.

390. CHEVALIER, A. 633.74:582
Nouvelles espèces de *Theobroma* (Cacaoyers). [**New species of *Theobroma* (cacao)**].
Rev. Bot. Appl. 1947 : **27** : 421–22.
An account is given of two new *Theobroma* species, *T. Cirmolinae* and *T. capilliferum*, described by Cuatrecasas.

391. 633.75:575:581.6(56)
KÜRÇAY, A. 633.75:576.16
Haşhaşlarin kültür şekline girmesinde Türk çeşitlerinin mevki ve rolü. (**Opium poppy cultivation. Position and part played by Turkish poppies**).
Çankaya Matbaasi, Ankara (Genel Sayi : 628) 1946 : No. 6 : Pp. 48.
In 1943 the Yeşilköy Seed Improvement Station began poppy trials with material obtained from local populations from poppy growing regions in Turkey, the object being to improve the quality of the morphine in Turkish opium poppies.
The present paper discusses the problems of classification of *Papaver somniferum*, and its polymorphic characters, as exhibited in *P. somniferum* vars *genuinum*, *stipitatum*, *officinale*, and *Hussenottii*; the areas of cultivation of the plant; and its main botanical characters as found in Turkey and some other countries. The colours of the seed from the Turkish poppy vary greatly, though in a few regions one colour predominates.
The Turkish poppy is remarkable for its height and for the fact that a single plant may have six to eight heads, or more, and the smokey colour of the shank. The corolla colour may be pink or red, purple, or white and is, according to the results of unspecified hybridization experiments, not hereditary.
The capsule characters of Anatolian, Iranian and Afghanistan races of poppies are compared. Among the varieties from the Isparta-Yalvaç district are some which do not lose the green colour of the capsule, so that it is difficult to decide when they are ready for cutting.
The amount of opium obtained per capsule is given as 0·085 grm.
Open and closed capsules found on one plant may be regarded as evidence of hybridization. Most Iranian varieties of poppies have indehiscent capsules.
According to the species, the number of locules may vary from four to eighteen: large capsules usually have more locules than small ones; Anatolian poppies generally have four to six in small capsules and 18 in large ones.
Experiments to find out whether the locule and disc ray numbers were inherited revealed that manuring had a marked effect on these features. Plants from high-lying districts have fewer locules and rays than plants near sea level and in the coastal regions.
Three types of discs are distinguished—hollow, flattened and conical: it is not yet known whether these differences are inherited or not.
Tables are given showing the oil content of seeds from various localities; the highest average content is from Afyon (49·30%), and next comes Tokat (47·48%), and Iran

(47·15%). Whether colour of seed and of corolla are correlated is not yet known. Variations in seed colour of *P. somniferum* are correlated with capsule shape and thickness of the seed coat. The colours and the oil content of seeds from different districts of Turkey are tabulated. Seed colour is hereditary; black is dominant to light colours and grey to white. The author has not yet been able to confirm the view that colour of seed and of corolla show some correlation.

Leaf shape can be used as a distinctive feature for types of Anatolian poppies and also for poppies from Turkestan and Turkey.

Opium yield and morphine content vary according to the variety. They are affected by environmental factors and can be increased by selection; the poppies of different countries and of different localities in Turkey differ in this respect. Observations at the Yeşilköy Seed Improvement Station support this assertion.

Various possible correlations between characteristics of the plant and yield and quality of the opium are to be published later.

Genetic, cytological and breeding studies by non-Turkish workers are cited, including Genner's work in Sardinia where hybrids of *P. Rhoeas* var. *pinnatidifolium* and *P. somniferum* var. *setigerum* were obtained.

The medicinal and "soft" opium type of poppies are discussed with reference to various localities of cultivation in Turkey. The "soft" opium type is used for smoking.

Six years' research at the Yeşilköy Station show that Turkish opium poppies must be improved and the opium content increased by cultural methods. Certain regions are suited to the "soft" type, others to the medicinal type. For oil, varieties with high oil content and low morphine content should be obtained and developed.

Part II of the monograph deals with the historical aspect and the sources, development and origin of various species of *Papaver*. It is believed that a thorough study of the plant would support the view that the original home of the poppy was Anatolia.

392. KEYWORTH, W. G. 633.79–2.482–1.521.6:575.42
Verticillium wilt of the hop (*Humulus lupulus*). II. The selection of wilt resistant varieties.
J. Pomol. 1947 : **23** : 99–108.

Varietal trials for wilt resistance in heavily infected soil are reported. In the preliminary trial all the selected varieties showed somewhat similar degrees of wilting, but subsequent trials in commercial gardens revealed considerable differences between them. Varieties OB53, OM26 and AEE55 were highly resistant and varieties 219, 1147 and OR55 appeared to be moderately so. It is concluded that the use of resistant varieties provides some prospect of wilt control, but the results of commercial trials suggest that the varieties may vary in their reactions to the disease on different farms, and it is thus possible that soil conditions or new strains of *Verticillium albo-atrum* may cause a breakdown of resistance.

393. NOTT, J. 633.79.00.14(42.47)
Hop variety trials, 1946.
Worcs. Agric. Quart. Chron. 1947 : **15** : 301–09.

Trials are reported of new hop varieties developed in recent years at Wye College and East Malling Research Station.

AROMATIC PLANTS 633.8

394. OZIRSKIĬ, V. I. 633.812:581.6:575.129
(An investigation into the nature and causes of chemical variation within the clone).
Jarovizacija i Selekcija (Vernalization and Plant Breeding) 1937 : 125–45.

Very considerable variations in oil content and several physiological characters relating to it were detected in the leaves of normal and polyploid plants of *Pelargonium roseum* hort. There was no evidence of any advantage to be gained by raising *P. roseum* hort. from seed produced by the polyploid form.

395. Chevalier, A. 633.821:576.16:582
La systématique du genre *Vanilla* et l'amélioration des plants de vanille. (**The systematics of the genus *Vanilla* and the improvement of vanilla plants**).
Rev. Bot. Appl. 1946 : **26** : 107–11.

The history of the cultivation and classification of *Vanilla* species is outlined. The probable origin of varieties cultivated in the French colonies is indicated and the characteristics of some of the varieties are described. It is thought that some wild varieties could probably be improved by cultivation and might prove useful.

396. Bouriquet, G. 633.821:578.08:575.127.2
Le Laboratoire de Phytopathologie et de Mycologie de Tananarive. Sa contribution à la vie économique de Madagascar. (**The Tananarive Laboratory of Phytopathology and Mycology. Its contribution to the economic life of Madagascar**).
Agron. Trop. 1947 : **2** : 36–46.

It is reported that a technique has been discovered for inducing the germination of seeds of *Vanilla planifolia* Andr., thus making it possible to attempt to improve the plant and increase its disease resistance by hybridization and selection. A new clone of exceptional vigour has already been established. Hybridization has been attempted between *V. planifolia* and *V. Decaryana* H. Perr., and *V. planifolia* and *V. Humblotii* Rochb.

OIL PLANTS 633.85

397. Sievers, A. F. 633.85(73)
The production of minor essential oils in the United States.
Econ. Bot. 1947 : **1** : 148–60.

Accounts are given of a number of cultivated and wild plants as sources of minor essential oils.

398. Scully, N. J. and
Domingo, W. E. 633.853.44:581.143.26.035.1
Effect of duration and intensity of light upon flowering in several varieties and hybrids of castor bean.
Bot. Gaz. 1947 : **108** : 556–70.

The effects of photoperiod and light intensity on castor bean varieties Kentucky **38**, DP. 227, their F_1 and F_2 progeny and on several other domestic varieties or selections are compared.

399. Ramanujam, S. and 633.853.48:581.04:576.356.5(54)
Deshmukh, M. J. 633.853.49:581.04:576.356.5(54)
Colchicine-induced polyploidy in crop plants.
Indian J. Genet. Pl. Breed. 1945 : **5** : 63–81.

Open-pollinated seeds from a single plant of each of the following species and varieties, *Brassica nigra* ($2n = 16$), *B. campestris* var. *toria* ($2n = 20$), *B. campestris* var. *sarson*, *B. juncea* ($2n = 36$), *B. Tournefortii* ($2n = 20$) and *Eruca sativa* ($2n = 22$), were treated with colchicine. The dry seeds were soaked in 0·1, 0·2 and 0·4% aqueous colchicine solution for 24 and 48 hours. The germinated seeds were treated with 0·025, 0·05 and 0·1% colchicine solution for 8 and 24 hours. The low percentage of survival among the treated seedlings indicated that the treatments had been generally drastic. In addition to the large number of tetraploids obtained in all the species, an octoploid in toria and an inversion heterozygote and chromosome deficiencies in diploid plants of *E. sativa* were produced. A toria mutant producing creamy petals instead of the normal yellow petals and another toria mutant with a tendency to develop double petals were also induced as a result of the colchicine treatment. Most of the induced changes developed as chimerical branches on diploid plants.

The C_1 generation of the tetraploids in all species were uniformly more vigorous than the diploids, possessing larger flowers, fruits and seeds, and thicker stems and leaves; the C_1 tetraploids were also slightly later in maturity. In the succeeding generations, however,

marked variability was noted in respect of these characters. The increase in pollen grain size observed in the C_1 tetraploids was, however, maintained in all the species investigated. The increased seed size of the C_1 tetraploid generation was maintained in toria. Study of seed size in tetraploids of the other species is in progress; the preliminary data suggest that seed size is variable in at least some of the species.

The tetraploids of all the species produced 90–95% good pollen. In spite of this high percentage of good pollen, seed setting in the tetraploids was usually lower than in open-pollinated diploid plants, the amount of seed setting varying among individual tetraploids. Doubling of the chromosomes was found to have no effect upon the self-sterility of the self-sterile species *B. campestris* var. *toria*, *B. nigra* and *E. sativa*. The poor seed setting shown by toria under conditions of open-pollination was thought to be due to the absence of a sufficient diversity of *S* genes in the small population derived from the treated seeds of a single plant of the variety. In order to obtain a greater diversity of *S* genes in the material, crosses were made between C_1 tetraploids and plants derived from a naturally occurring tetraploid of an unrelated variety of toria. With selection for seed-fertility in succeeding generations, it has been possible to improve the average seed-fertility of the entire population.

The tetraploids of the self-fertile species, *B. campestris* var. *sarson*, *B. Tournefortii* and *B. juncea*, which also showed a reduced and variable seed-setting, are under selection for seed-fertility.

In the tetraploids of all the species studied, quadrivalent formation was found to be much lower than that expected on theoretical grounds. With the exception of *B. juncea*, a fairly regular meiosis was observed in the tetraploids, in conformity with the data obtained on pollen viability; it therefore appears that the low and variable seed-fertility cannot be explained only on the basis of meiotic irregularities. In the case of *B. juncea*, an allopolyploid species (cf. *Plant Breeding Abstracts*, Vol. XV, Abst. 36), chromosomal irregularities were observed which would probably account for a fair amount of seed-sterility.

The tetraploids of toria and sarson bred more or less true for the tetraploid chromosome number. In the case of the species other than *B. campestris*, there was evidence that plants with odd chromosome numbers were produced somewhat more frequently, particularly in the case of *B. juncea*.

It was found that tetraploidy in *B. campestris* increased its crossability with *B. juncea*. Tetraploids of *B. campestris* seldom crossed with their diploid parents under conditions of open-pollination. In tetraploids of *B. juncea* natural crossing with the diploid form of the species occurred more often; tetraploids of *B. juncea* also crossed more readily with the diploids of other species under open-pollination.

The results so far obtained in these experiments on tetraploid forms of oil-bearing *Brassicae* suggest that it may be possible to develop tetraploid varieties of *B. campestris* with high seed fertility and increased seed size, which would be economically more valuable than the existing diploid varieties. Further work is in progress to investigate the possible value of the tetraploids of the other species.

400. Tai, S. N. and Chiang, P. C. 633.853.49:575(51)
(Method of rape breeding).
Nung Pao 1941 : **6** : 667–80.

Breeding experiments were made on 125 varieties of *Brassica campestris* L., *B. cernua* Thunb. and *B. juncea* Coss. In the first two years the experiments were conducted in Kweichow; in the third year they were made in Szechuan.

The characters investigated included: percentage fruit set; number of seeds per silique; weight of seeds per silique; length of silique; width of silique; length of silique stalk; length of silique beak; yield per plant; plant height; number of inflorescences; length of inflorescence; weight of seeds per inflorescence; and average yield per mou.

It was concluded that the pure line method of breeding could be used in the case of *B. cernua* and *B. juncea*. The breeding of *B. campestris* was more difficult on account of its self-incompatibility; the structure of the flower also rendered large-scale hybridization difficult. A possible method of artificial selfing is suggested.

401. 633.853.49:581.4:575.11.061.6
633.853.49:581.4:575.11.061.1
Sun, P. C.
(Genetic studies on *Brassica juncea* Coss. I. Flower colour, leaf shape, seed colour and branching habit).
J. Agric. Ass. China 1945 : Suppl. No. 50 : 12–13. (Abst. 25th Annu. Mtg).

Genetical studies were carried out during the period 1941–44 on *B. juncea* var. *oblanceolata* (Coss.) Sun, *B. juncea* var. *gracilis* (Coss.) T. and L. and *B. juncea* var. *linearifolia* (Coss.) Sun. Both the yellow and white flowered forms of *B. juncea* var. *gracilis* were used. The flowers of the other two varieties are yellow.

The data from crosses between yellow flowered and white flowered varieties indicate that flower colour depends upon two genes, designated Y_1 and Y_2. The gene Y_1 produces yellow flowers and is epistatic to Y_2, the latter gene giving light yellow colour. Plants of the genotype $y_1y_1y_2y_2$ bear white flowers.

The seeds of varieties *oblanceolata* and *linearifolia* are purple coloured, those of the white flowered form of variety *gracilis* are yellow. The F_1 hybrids of crosses between the two seed colour types bore purple seeds; the seeds of the F_2 occurred in the ratio of 15 purple : 1 yellow. Two supplementary genes are therefore concerned in the production of seed colour, the presence of either of which produces purple seeds. The two genes are designated R_1 and R_2. Yellow seeds are of the genotype $r_1r_1r_2r_2$.

Except in the case of one F_3 ratio, the data obtained on the inheritance of leaf shape could be explained by assuming that the variety *linearifolia* has a dominant gene L for narrow leaves, the variety *oblanceolata* has a gene I_1 inhibiting the development of linear leaves and the recessive gene l for narrow leaves, and that the white flowered form of the variety *gracilis* has possibly two genes, I_1 and I_2, which inhibit the development of the linear form of leaf.

In a cross between the low-branching variety *oblanceolata* and the high-branching white-flowered form of variety *gracilis*, the branching habit of the former showed dominance in the F_1. In both the F_2 and F_3 generations plants occurred in the ratio of 15 high branching : 1 low branching. It therefore appears that two supplementary genes are present. The variety *linearifolia* has an intermediate type of branching habit; when this variety was crossed with variety *oblanceolata* a complicated segregation occurred.

402. Sun, P. C. 633.853.49:582(51)
(Taxonomy of rape in southwestern China).
Nung Pao 1942 : **7** : 73–74.

Rape collected in south-western China was found to belong to *Brassica juncea* Coss. var. *elegans* Chu and *B. chinensis* L. var. *pandurata* Sun. A taxonomic key is given for Chinese *Brassica* species and varieties.

403. Langham, D. G. 633.853.74(87)
Potentialities of sesame as a commercial crop.
Agric. Amer. 1947 : **7** : 116–17.

The economic value of sesame is discussed. Reference is made to breeding work in progress at the Instituto Nacional de Agricultura, in Venezuela; several papers dealing with these investigations have been previously summarized in *Plant Breeding Abstracts*. A single stalked variety, known as Venezuela–51, has been developed, which ripens more uniformly from base to tip than other varieties. An indehiscent, non-shattering mutant has been isolated. The gene for closed seed pod must, however, be transferred to high-yielding varieties. In addition, suitability for machine harvesting and disease resistance are receiving attention. In the breeding programme use is being made of wild material.

404. Langham, D. G. 633.853.74:575.11.061.6
Genetics of sesame. IV. Some genetic variations in the colour of the sesame flower.
J. Hered. 1947 : **38** : 221–24.

A study of approximately 15,000 segregating populations of *Sesame indicum* L. showed that qualitative factors for colour characters gave simple Mendelian ratios. It was found that four different sets of factors determine the expression of each character. The basic factors

determine whether or not the colours will manifest themselves; the colour factors determine which type of colouring matter will be present; the pattern factors determine the distribution of the colouring matter, if present; and the intensification factors control the amount of colouring matter present. The effect and mode of action of the known factors in each group are described. Although genotypically independent, the four factor groups show epistatic interactions in the phenotypes. The genetical data resulting from this investigation have been used in the preparation of a linkage map for sesame.

405. GRIEBEN, H. and LAMAS, P. J. A. 633.854.54–2.4–1.521.6(82)
El cultivo del lino para aceite en Argentina. (**The cultivation of flax for oil in Argentina**).
Misc. Publ. Minist. Agric. Nac. B. Aires **1947** : No. **234** : Pp. **31**.
Information is included on the origin, morphological characters, regional adaptability and resistance to *Melampsora Lini*, *Fusarium Lini* and *Sphaerella Linorum* of the following linseed varieties: Querandí M.A., Klein II, Entre Ríos, Benvenuto Labrador, Buck 3, Buck 114 and La Previsión 18.

406. BLACKMON, G. H. 633.854.56
Tung oil—a gift of China.
Econ. Bot. **1947** : **1** : **161–75**.
The article includes an account of the tung tree in China, the uses of the oil, the introduction of *Aleurites Fordii* into the United States, the varieties distributed and the research work being carried out on the tung tree in the United States, and various other topics.

407. STOCKAR, A. 633.854.56:575.127.2
Comunicación preliminar sobre hibridaciones entre varias especies de *Aleurites*. (**Preliminary communication on hybridizations between various species of *Aleurites***).
Rev. Argent. Agron. **1947** : **14** : **33–38**.
Descriptions are presented of the leaves, nectaries, inflorescences, flowering behaviour and fruits of *A. Fordii* x *A. montana*, *A. Fordii* x *A. cordata*, *A. montana* x *A. cordata* and three back-cross hybrids.

408. STOCKAR, A. 633.854.56:576.312.35
Complemento cromosómico diploide de algunas especies de "Aleurites". (**Diploid chromosome complement of some species of *Aleurites***).
Rev. Argent. Agron. **1946** : **13** : **253–55**.
The diploid chromosome number and chromosome dimensions of five species of *Aleurites* have been investigated. *A. Fordii*, *A. montana*, *A. cordata* and *A. trisperma* have $2n = 22$ chromosomes, *A. moluccana* has $2n = 44$ chromosomes.

409. WEBSTER, C. C. 633.854.56:581.165:575.42(68.9)
L'amélioration du "tung" au Nyassaland. (**The improvement of the tung tree in Nyasaland**).
Agron. Trop. **1947** : **2** : **72–76**.
This paper is an almost complete translation of an earlier paper already reviewed in *Plant Breeding Abstracts* (cf. Vol. XVI, Abst. 1094).

410. WEBSTER, C. C. 633.854.56:581.165.1(68.9)
Notes on some clones of budded tung (*Aleurites montana*).
Nyasald Agric. Quart. J. **1946** : **6** : **73–79**.
It is explained that yield data have not yet been recorded for a sufficient number of years to make it possible to draw any very definite conclusions about the performance of the different tung clones. The information so far available is presented, however, notes being included on habit, vigour, precocity and flowering.

411. LIN, K. 633.854.56–1.53(51)
(**Morphology and experimental propagation of *Aleurites montana***).
Nung Pao **1944** : **9** : **366–69**.
A general description is given of the structure of the flowers and fruits and of the vegetative

habit of the Mu oil tree (*A. montana*) in the Kwangsi province. Observations are also recorded on fruit setting, fruit drop, oil content and oil quality.
Only half of the trees could be propagated by seed. In several groves it was found that on the average 48·9% of the trees were pistillate, 46·5% staminate and 4·5% monoecious. In the experiments propagation by budding was found to be satisfactory both as regards establishing a greater number of trees and in controlling the sex ratio; the planting of two staminate to every ten pistillate trees is recommended.

412. Blackmon, G. H. 633.854.56–1.557:575(75.9)
Report on yields of tung trees from selected parentage.
Proc. Amer. Tung Oil Ass. 1944 : **10** : 53–56.

Annual yields have been recorded for individual tung-oil trees since 1922. Two trees outstanding in their performance, F–2 and F–9, have been propagated. Their average annual production, in pounds, as whole fruit, seed weights and oil, is tabulated for 13, 15, 17, 19 and 22 years respectively. Tests of the progeny of these strains were started in 1930. Since the trees came into production only one good crop has been harvested. This was in 1940 when the average yield per tree in pounds of whole fruit was 82·2 for the F–2 seedlings, 44·1 for the F–2 buds, 73·8 for the F–9 seedlings and 60·8 for the F–9 buds. The yields for eight years are tabulated. A large percentage of the seedlings resemble their respective parents in being prolific. They were all produced by open pollination.

413. Unrau, J. 633.854.78:575.125:581.162.5
Heterosis in relation to sunflower breeding.
Sci. Agric. 1947 : **27** : 414–27.

The literature on heterosis and tests of combining ability in sunflowers is briefly reviewed. An account is given of diallel crossing experiments on four inbred Mennonite lines, two introduced Russian lines and the variety, Sunrise, descriptions of which are included. Heterosis was most marked in hybrids between lines with good combining ability. Seeds of hybrids with lines F or G as one parent showed improvement in oil content, plumpness, size and uniformity of shape and were immune to sunflower moth damage. All hybrids except those involving line E were earlier than either parent. Methods for testing combining ability are discussed.

414. Vydrin, V. I. 633.854.78:581.056:575"793"(47)
(**Production of sunflower varieties for Western Siberia**).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : No. 6 : 50–57.

The frost-free period in Western Siberia lasts only 120 to 130 days and exceedingly early varieties are required. Yields of over 20 c. per ha. have been obtained in some parts of the steppe and forest steppe. An examination of the local forms revealed a number with high oil content but none with specially early maturity. Hybridization work has been successful only since 1938, when the forms with a high oil content from the All-Union Institute for Oil Crops were first used. Intervarietal and group crosses have been made and a number of natural hybrids have also been employed. Artificial pollinations were made with a mixture of pollen from several plants of the same variety, without emasculation of the seed parent. Pollination with pollen mixtures from several varieties and free interpollination between a number of varieties were also adopted. Without waiting for segregation and selection, the F_1 hybrids were immediately crossed again with other varieties in order to lead as quickly as possible to the desired combinations of characteristics. After that, individual plant selection was practised. Groups of selected plants were planted together in spatial isolation and allowed to interpollinate, and in this way inbreeding depression was avoided.
Several new sunflower varieties have been produced by this method at the Barnaul Station. One of these is Skorospelyĭ Prjamostojačiĭ [Early Erect], a selection from Omsk Early. Like the parent, it ripens in 98 days from sowing and 80 days from seedling emergence. It exceeds the parent variety by 7·6% in seed yield and by 0·5% in oil content. Several varieties are described in the next earliness group, ripening with Pioneer of Siberia, 98 days from seedling emergence; the three varieties Barnaul 2291, Barnaul 2296 and Complex No. 1, all ripen in 103 days from emergence and have excelled Pioneer of Siberia in a three year test by 11·5 to 17·2% in seed yield, by 2·5 to 4·1% in oil content and by 22·2 to 26·5%

in yield of oil per hectare. One of these, No. 2296, has been renamed Barnaul 28 and is specially promising. It is described as having a low husk percentage of 36.1%, an oil content of 59·0% in the kernel and 37·7% in the whole seed, and yielding 5·01 centners of oil per hectare. It is low in stature and has an upright, compact head suitable for mechanical harvesting.

415. HEISER, C. B. (JUN.) 633.854.78:582(72)
A "new" cultivated sunflower from Mexico.
Madroño 1946 : **8** : 226–29.
A description is presented of a late-maturing sunflower variety collected at Teocaltiche, Jalisco, where it is known as maíz de teja. In most respects it shows resemblances to the Hopi sunflower, but the achenes have a small beak. The involucral bracts are attenuate, a character which it has in common with the Mammoth Russian variety.

416. ETCHECOPAR, J. A. 633.854.78–2–1.521.6:581.6:575.12(82)
El mejoramiento del girasol en la Argentina. (**The improvement of the sunflower in Argentina**).
Rev. Argent. Agron. 1947 : **14** : 43–49.
Mass and individual plant selection of sunflower has been practised in Argentina, the initial material being mostly Russian. It has been found that attack by white rust can be avoided by planting early varieties. Several wild sunflowers are resistant to bacterial attack; hybridization between these and the cultivated varieties, all of which are susceptible, is suggested. The production of F_1 hybrids from inbred lines has been effected; this method shows promise for improving seed and oil yields.

417. ŠČERBAK, S. N. 633.854.78–2.421.6–1.521.6
(**Difference of varieties of sunflower with regard to reaction to *Sclerotinia***).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : Nos 7–8 : 34–39.
Observations on sunflowers in the unusually wet year 1945, when *Sclerotinia* attack was unusually severe, showed marked differences between varieties. No clear correlation was observed between degree of resistance and earliness or pigmentation.

418. 633.855.34:575.42(5)
FERRAND, M. 633.855.34:575.42(67.5)
La culture du palmier à huile. (**The cultivation of the oil palm**).
Oléagineux, Paris 1947 : **2** : No. 1 : 1–10.
The origin of the palm tree is discussed. An account is given of the results of selection of trees in the Malay Archipelago and Belgian Congo, and the necessity for research stations to deal with this and other problems of the planters is pointed out. Work on selection is reported to be now in progress in the Belgian Congo.

MEDICINAL PLANTS 633.88

419. MIRIMANOFF, A. 633.88:581.192:576.356.5
Procédés modernes de culture de plantes officinales. (**Modern methods of culture of medicinal plants**).
Rev. Bot. Appl. 1947 : **27** : 417–18.
Reference is made to the effect of induced polyploidy on the alkaloid content of the Solanaceae.

420. MURTHI, S. N. 633.88:581.3
Studies in the Labiatae. IV. Contribution to the morphology of *Orthosiphon stamineus* Benth.
J. Indian Bot. Soc. 1947 : **26** : 87–94.
The megasporogenesis, fertilization and embryology of *O. stamineus* Benth. are described.

421. Chevalier, A. 633.88:582(6)
Quelques *Strychnos* africains inoffensifs ou peu toxiques. (**Some innocuous or slightly toxic African *Strychnos* species**).
Rev. Bot. Appl. 1947 : **27** : 353–77.
Fourteen *Strychnos* species of tropical Africa are described. One of them, *S. pseudo-Jollyana*, is a new species.

RUBBER PLANTS 633.91

422. Bangham, W. N. 633.912(7+8)
Plantation rubber in the New World.
Econ. Bot. 1947 : **1** : 210–29.
The various problems encountered in establishing *Hevea* plantations in the Americas are described. Reference is made to the planting stock used, breeding investigations, and work on the control of *Dothidella* leaf blight. The status of *Hevea* plantations at the end of the war emergency period and possible future developments of rubber growing in the New World are outlined.

423. Ducke, A. 633.912:582(81)
Novas contribuições para o conhecimento das seringueiras de Amazonia Brasileira II. (**New contributions to our knowledge of the rubbers of the Amazon Basin of Brazil II**).
Bol. Téc. Inst. Agron. Norte, Brasil 1946 : No. 10 : Pp. 24.
The species of *Hevea* known to inhabit the Amazon Basin of Brazil are described, and information is given on their geographical distribution, natural variation and affinities.

424. Mendes, L. O. T. 633.912:581.04:576.356.5
Investigações preliminares sôbre a duplicação do número de cromosomios da seringueira pela ação da colchicina. (**Preliminary investigations on the duplication of the chromosome number of rubber by the action of colchicine**).
Bol. Téc. Inst. Agron. Norte, Brasil 1946 : No. 7 : Pp. 60.
Tetraploid ($2n = 72$), octoploid ($2n = 144$) and various mixoploid plants have been obtained by treating a series of rubber clones (*Hevea brasiliensis*) with colchicine. Details of the alterations observed in the morphology and anatomy of the leaf are included.

425. Mendes, L. O. T. 633.912–2.8–1.521.6(81)
O superbrotamento da seringueira *Hevea brasiliensis* Muell. Arg. (**Excessive proliferation of rubber *H. brasiliensis* Muell. Arg.**).
Bol. Téc. Inst. Agron. Norte, Brasil 1946 : No. 5 : Pp. 12.
A new disease bringing about abnormal leaf development in *H. brasiliensis* is described. It is believed to be caused by a virus. Details of the clonal susceptibility of the mother trees of the Instituto Agronômico do Norte, Belém, Pará, Brazil are given.

426. Whaley, W. G. and
Bowen, J. S. (compilers) 633.913:016
Russian dandelion (kok-saghyz)? An emergency source of natural rubber.
Misc. Publ. U.S. Dep. Agric. 1947 : No. 618 : Pp. 212.
A review is presented of investigations in the United States on various aspects of growing kok-saghyz for rubber production, conducted during the period between early summer, 1942, and June, 1944, under the Emergency Rubber Project. Useful bibliographical lists are given of the literature cited in the review, processed and typewritten reports, and additional papers by investigators in Russia and other countries.

427. Cronquist, A. 633.913:582:576.16(71+73)
Revision of the North American species of *Erigeron*, north of Mexico.
Brittonia 1947 : **6** : 121–302.
A taxonomic monograph is presented of the North American species of *Erigeron*. There is a preliminary discussion of the taxonomic relations and probable phylogeny of the genus.

428. MONACHINO, J. 633.919:582(8+72)
A new species of *Couma* from Colombia.
Trop. Woods 1947 : No. 91 : 38–40.

A brief summary is given of extensive field investigations recently carried out under the auspices of the Chicle Development Company which have thrown light on the distribution and taxonomy of *Couma* species. *C. guatemalensis*, discovered in Guatemala in 1926, is a valuable laticiferous tree.

The author describes the new species *C. multinervis*, from material collected in the course of exploration of the Vichada River area, Colombia.

FRUITS AND NUTS 634

429. LECRENIER, A. 634:575(49.3)
L'arboriculture fruitière et la recherche scientifique. (**The cultivation of fruit trees and scientific research**).
Ann. Gembl. 1947 : 53 : 131–39.

Work on the characteristics of different varieties, the improvement of existing varieties by selection and the creation of new varieties is reviewed.

430. 634:575(49.4)
Rapport d'activité 1945. (**Report of activity 1945**).
Publ. Sta. Fédérale essais Viticoles Arboricoles Chim. Agric. Lausanne Pully 1946 : No. 351 : 741–842.

Apple
5,000 stocks obtained from seeds from the hybrids made in 1943 have been planted.

Pear
The hybrids made at the Station in 1939 have fruited, and have been tested for preserving qualities.

Apricot
The following crosses have been made with the aim of obtaining a variety with the quality of Luiset but later flowering or better able to withstand low temperature, so as to protect the flowers from the spring frosts: Bessarabie x Luiset, Bessarabie x Poizat, Luiset x Poizat and Luiset x Paviot.

Cherry
The object of the cherry hybridizations is to obtain early fruiting varieties with firm flesh.

Vine
The effects of temperature and sugar concentration on the growth and development of the pollen tubes of the White Chasselas vine are described. The results obtained are used as a probable explanation of the liability of the variety Chasselas to produce small seedless grapes (millerands) and to drop its fruits.

Two new crosses, S.1000 x S.5455 and S.5455 x S.1000, have been made with the aim of creating a variety with a suitable period of maturity and a viticultural value at least equal to that of varieties already in use.

The results are given of 5 years' observations of the characters of different varieties of stocks.

The characteristics of 28 varieties of table grapes are tabulated.

431. 634:575:061.6(48.5)
Balsgård—den nya institutionen för fruktträdsförädling. (**Balsgård —the new institution for fruit tree breeding**).
Försök och Forskning 1946 : 3 : 17–20.

The foundation of this Institute, its objects, and its work on the production of polyploid apples and other fruits, and their use in breeding are recorded (cf. also *Plant Breeding Abstracts*, Vol. XVII, Absts 334–7).

432. SCHMIDT, M. 634:575.12(43)
Wo stehen wir in der Frage der Neuzüchtung im Obstbau? (**What is the position as regards the breeding of new forms in fruit growing ?**).
Z. Baumschule **5** : (Undated) : Pp. 28.

In Germany the breeding of new forms of stone and pome fruit should be carried out at breeding centres, owing to the space and time required and the cost, but amateurs and nurseries should also share in the work; berry fruits may be dealt with by private breeders. The usual methods of fruit breeding are discussed. Breeding for frost resistant stem-builders is important. The production of new frost resistant varieties showing good yield and quality is essential; during this process all facts concerning frost resistance and the influence of stocks must be collected and due regard paid to geographical suitability.
In U.S.A. and Russia frost resistant wild forms have been used in crosses, but the frost resistant new types give poor fruit. The author crossed *Prunus spinosa* with the relatively frost resistant Grosse Reine Claude; highly frost resistant seedlings with good fruit resulted. The influence of parents on frost resistance is tabulated for varieties and hybrids of apple. The result of pollinating Cox's Orange-Reinette by Geheimrat Dr Oldenburg, both frost susceptible varieties, was remarkable, the number of undamaged seedlings being as high as when the much hardier Jonathan was used as the male parent. The same female parent crossed by Schöner aus Nordhausen gave a very high percentage of sound seedlings under low temperature conditions. On pollinating the frost resistant Apfel aus Croncels (which gave 80% sound seedlings from open-pollination) with the frost susceptible Baumanns Reinette, the progeny show the marked influence of the mother's frost resistant character. Danziger Kantapfel and Apfel aus Croncels, both frost resistant, on crossing gave only frost resistant progeny. The frost resistant Weisser Klarapfel and Apfel aus Croncels on crossing gave only sound progeny but from the cross Weisser Klarapfel x Danziger Kantapfel some dead and damaged seedlings resulted. The cross Weisser Klarapfel x Baumanns Reinette gave few sound, but no dead, seedlings, so here, it seems, the genes for frost resistance and susceptibility balanced each other. In general the experiments showed the marked segregation in progenies as regards frost resistance, as for all other characters. Resistance and susceptibility to frost of parent variety is typical for the variety and so heritable. Frost resistance of varieties is usually due to the early completion of their vegetative period. Danziger Kantapfel and Schöner aus Nordhausen are suggested for crossing with late ripening, well-flavoured leading varieties to produce frost resistant late varieties; similarly apple varieties already proved satisfactory in eastern Poland are suitable initial varieties for hybridization with leading German varieties.
A whole series of the author's seedlings were frost resistant, kept well and were of good flavour; such forms occurred even in the progeny of frost susceptible varieties and these unusual types were grown in East Prussia, Klagenfurt and Poland.
The importance was established of selection of the mother parent under frosty conditions for obtaining seedling stocks.
In the case of pears suitable initial forms of cultivated varieties are so few that interspecific hybridization with wild forms is still necessary in breeding for frost resistance.
For cherries and plums there is no clear proof that varietal reaction to frost is hereditary. Frost resistant types, however, were selected. The sour cherries Grosse Lange Lotkirsche, Ostheimer Weichsel, Minister von Podbielski and Exzellenz von Hindenburg are suitable frost resistant initial forms for improving the collection.
In the case of apples and plums attempts have been made to select for late flowering forms, which will be unaffected by late frosts. By crossing late flowering with early flowering forms the late flowering character has been found to be transmitted to most of the progeny, but the fruit quality is not yet satisfactory.
So far, no apple variety cultivated in Germany has been found resistant to *Venturia inaequalis* under all conditions, but some pear varieties seem to have a certain resistance thereto. In breeding for scab resistance the possibilities are discussed of using wild or ornamental forms of apple (e.g. *Malus micromalus*) and also other species of *Malus* which show scab resistant progeny. Apart from these methods, in a collection of 1638 Antonowka seedlings of Polish origin 117 were selected as scab resistant and will be tested soon for quality of fruit, etc. The progeny of Antonowka also showed many seedlings relatively

scab resistant which were also frost resistant, so the variety is valuable as a parent. The large number of different races of the scab fungus attack many but not all varieties. The possibility of the existence of a specially active race that could attack hitherto resistant seedlings should be investigated by large scale testing of apples and pears in many widely separated localities.

Monilia disease especially attacks stone fruits, sour cherries and the morello cherry in particular. Counter measures have been only partly effective, so that a sour cherry resistant to *Monilia* and as like the morello as possible should be an aim in breeding. In tests for susceptibility to *Monilia*, carried out with sour cherries and Amarelles it was found that at the point of infection a resin is exuded in resistant types, but scarcely or not at all in non-resistant; the amount of gum is an additional criterion for resistance. A resistant sweet cherry x morello gave no resistant progeny, but some of the hybrids when crossed with sour cherry produced a few resistant seedlings.

The morello though self-fertile shows a remarkable amount of segregation. It is suggested that by using colchicine a self-fertile sweet cherry might be evolved.

The recording of bud mutations in U.S.A. is approved of. Buddings of Gravensteiner, Wintergoldparmäne and Delicious were irradiated by X-rays; results are awaited.

Prolonged experiment has shown that different apple varieties have different breeding values for individual characters. The importance of studying progenies in choosing varieties for seedlings is stressed. E. W.

433. 634:581.162.3(49.2)

GERRITSEN, J. D. 634:581.142:581.331.2(49.2)

Bestuiving en stuifmeelonderzoek van fruitrassen. (**Pollination and examination of pollen of varieties of fruit**).

Fruitteelt 1947 : **37** : 90–91.

Poor germination of pollen has been shown by the following varieties:

Apple

Bramley's Seedling, Schoone van Boskoop, Jacques Lebel, Fransche Zure, Reinette van Elkenstein, Lemoenappel, Notarisappel and Zoete Ermgaard.

Pear

Beurré Alex, Lucas, Beurré de Merode, Juttepeer, Marquerite Marillat, Williams Duchess, Sucre de Montluçon, St Remy and Beurré d'Amanlis.

Cherry

Bruine Waalsche, Roode Waalsche, Dubbele Meikers and Volger.

Germination of these pollen grains was less than 25%, mostly less than 15%. Zoete Ermgaard and Marquerite Marillat gave practically no germination.

Bramley's Seedling, Lemoenappel and Notarisappel are of no value as pollinators of Goudreinette. Zoete Ermgaard is completely useless as a pollinator for Sterappel and Meikers is of little value for Wijnkers. C. B.

434. ALMEIDA, C. R. MARQUES DE 634:581.162.5:578.6

Um novo método para o estudo da produtividade das fruteiras. (**A new method for studying the productivity of fruit trees**).

An. Inst. Sup. Agron. Lisboa 1942 : **13** : 99–103.

A technique is described for staining and dissecting the styles of fruit trees in order to investigate the behaviour of germinating pollen tubes.

435. *OZBEK, S. 634.1:581.162.4(56)

Çiçek tomurcugu tesekkülü esas tutularak kastamonu dolaylarindaki en önemli meyve türlerinin verimliligine tesir eden biyolojik faktörler üzerinde araştirmalar. (**Flower bud formation and investigations on the biological factors influencing productiveness in the chief fruit varieties in Kastamonu**).

T.C. Ziraat Vekâleti. Ankara Yüksek Ziraat Enstitüsü. 1943 : No. 143 : Pp. 88.

An account is given of the formation of flower buds and of fruits in the apple varieties

* An extended summary of this paper is on file at the Bureau.

Amâsya, Hüryemez, Kabamisket, Ağustos and Sinap and the pear varieties Malatya, Azdavay and Tosya.

436. Moore, R. C. 634.11:575.12
Apple breeding. Report on results obtained at V.P.I.*
Eastern Fruit Gr. 1945 : 7 : No. 11 : 10, 19, 26.

Varietal crosses made in 1936 and 1937 are reported. About 12,000 of the seedlings thus obtained were top worked on to older trees, and the best of those which fruited were selected for testing, breeding and further observation. Two of the seedlings, 336 and 1018, which have borne fruit in quantity for two seasons, appear promising. The fruits of 336, a Winesap x Rome cross, are of good size and appearance, and have a flavour between sweet and sub-acid and somewhat better than Rome; the tree fruited early, and seems to be an annual bearer with a long blooming season. No. 1048, a Jonathan x Lowry hybrid, produced a heavy crop of sub-acid, fine textured apples which keep well.
C–4–189, a cross between Arkansas Black and Delicious, was notable for disease free leaves and had fruits of fairly good flavour, colour and size.
In the progeny of Winesap x Rome crosses, long stems predominated and the fruits were mostly mild to sub-acid. A number of them were of a definite type in which the fruit resembled Stayman in shape and colour, were very hard when picked but soon softened, and usually became mealy in texture and flat in flavour.
Seedlings from the Winesap x Delicious cross were mostly lacking in vigour.
Further hybridizations carried out in spring 1944 are reported.
Methods of apple breeding are briefly described.
Figures showing the relative popularity of different varieties are presented and the characteristics of some of them discussed.

437. 634.11:581.165.711
Johansson, E. 634.12:581.165.711(48.5)
Sort- och grundstamförsök med äpple 1934–1945. **(Variety and stock trials with apples 1934–1945).**
Fruktodlaren 1947 : No. 3 : 82–85; No. 4 : 120–22.

The results obtained with seedlings of Cox's Orange and Gravenstein and also wild apples or clones of different types of *Malus* on various East Malling and Alnarp stocks are reported. Winter hardiness, early bearing and productivity were among the points studied.

438. Gagnieu, A. 634.11:581.331.2:576.356(44)
Comportement caryologique et caractères du pollen de diverses variétés de pommiers du centre de la France. **(The caryological behaviour and characters of the pollen of different varieties of apple trees of the central region of France).**
Ann. Agron. Paris 1947 : (N.S.) 17 : 365–92.

Observations are reported on the pollen of 115 apple varieties. Chromosome counts at mitosis showed that some of these were diploid and others triploid. In the triploids and some of the diploids, meiotic irregularities were observed. Cell fusion, which has usually been associated with meiotic irregularities, is reported in the pollen mother cells of varieties with normal meiosis. The appearance of the pollen grains in acetocarmine and their percentage germination in culture solution are described. The majority of the diploids showed a high percentage of viable pollen, and the triploids a low percentage. The observable characteristics of the pollen can be correlated in some cases with the regularity or degree of irregularity observed at meiosis, but in other cases, inhibited development of the pollen grains is presumably due to the presence of lethal genes.

439. Quantz, L. 634.11–2.411.4–1.521.6
Über Infektionsversuche mit einer *Phytophthora* von Aprikosenfruchtfäule. **(Infection experiments with a *Phytophthora* from apricot fruit rot).**
Festschrift zur Feier des achtzigsten Geburtstages von Otto Appel Berlin-Dahlem 1947 : 63–64.

A *Phytophthora* to be classified near *P. cactorum* was isolated from apricots suffering from

* Virginia Polytechnic Institute.

a brown rot. This fungus also caused a brown rot in tomato, apple and peach. Sixteen apple varieties were tested with this strain and all became diseased, varietal differences being shown in the rate of spreading of the diseased patches. In apples disease only develops at points of previous surface injury, but in peaches apparently even those with intact surfaces can become affected. E. W.

440. ALDERMAN, W. H. and HARALSON, F. E. 634.11–2.421.9–1.521.6 634:575(77.6)
Fruit breeding farm report for 1945.
Minn. Hort. 1946 : **74** : No. 1 : 3, 12–13.

Differences in the resistance of apple varieties to apple scab are reported. Minnesota 240 was almost free from scab, and Minjon was outstanding for its freedom from scab on the fruits. Haralson, Wealthy and Prairie Spy proved very susceptible.

Crossbred seed was obtained in the greenhouse from hybrid plums, European plums, sand-cherry hybrids, sweet and sour cherries, and apricots. In the field, ample strawberry seed was obtained and breeding work with grapes and raspberries was partially successful but the apple programme was almost a complete failure.

A preliminary report is given of the breeding work with apricots, European plums and peaches. Tests of existing varieties of European plums and damsons indicate that some are hardy enough for planting in the southern half of Minnesota. Work on the production of new varieties of these fruits is in progress and some 3000 seedlings are growing in first-test orchards. Peach breeding work is confined to straight selection for winter hardiness of the tree and fruit buds. About 1400 seedlings are being grown. Some of these fruited in 1945. A few varieties in second tests produced very satisfactory crops. Minnesota 9 seems to be the best of them. Most of the hardy seedlings are of a small, white fleshed type and ripen late.

A list of 18 fruit varieties, nearly ready for introduction, is given.

441. DERMEN, H. 634.13:576.356.5:581.04
Polyploid pears.
J. Hered. 1947 : **38** : 189–92.

One year-old pear trees were treated with colchicine solution, the solution being applied at various stages of growth from fully opened buds to shoots three inches long. Two kinds of colchicine solution were used. One consisted of 1% aqueous colchicine solution, to each 10 cc. of which were added six drops of 10% Santomerse wetting reagent. The other was 1% colchicine in 50% glycerine-water solution, with the Santomerse wetting reagent added as in the first case. The treatments were as follows: (1) some plants were treated with the aqueous colchicine solution: (2) some were first treated with the aqueous solution, later with the glycerine-colchicine solution; and (3) others were treated with the glycerine-colchicine solution only. Of the plants that received treatment (1) some were given four treatments at four-day intervals; the remainder were subjected to daily treatments on five consecutive days. Those trees that received treatment (2) were treated at two-day intervals, with one to three applications of the aqueous solution and two applications of glycerine solution. The plants receiving treatment (3) were given two applications at a two-day interval. Polyploid branches were obtained as the result of all three treatments. Polyploidy was, however, induced most often by treatments (2) and (3). Although the glycerine-colchicine solution was in all cases injurious to the treated shoot tips, it is considered that with certain modifications use of such solution is preferable to the aqueous solution to induce pear polyploids.

Differences in the size of the leaves and floral organs of diploid and polyploid branches were detectable upon careful examination. The tetraploid condition of a number of branches was confirmed by the larger size of the pollen grains.

Tetraploid pollen from selection No. 504 was used to pollinate flowers of the diploid varieties Seckel, Winter Nelis, Winter Bartlett, Pulteney and a Seckel-like variety of unknown origin. Twelve seedlings were secured with a triploid or approximately triploid chromosome number.

The author describes a technique considered to be the most satisfactory. The solution recommended consists of 1% colchicine in 20% glycerine-water, to each 10 cc. of which are added two drops of 10% Santomerse.

442. 634.2:576.312.35
634.2:576.16
TETEREV, F. K. 634.2:575.127
[*Cerasus fruticosa* (Pall.) Borkh.—its breeding and cultivation in the central and northern parts of the U.S.S.R.].
Jarovizacija i Selekcija (Vernalization and Plant Breeding) 1937 : 94–124.
This cherry is said to be a compound species consisting of *C. fruticosa* (Pall.) Borkh. sens. str. and *C. arborescens* nov. sp. The haploid number of chromosomes is 16. This also is the number in many cultivated cherries of the Volga and Ural regions, and in many of Mičurin's best varieties of cherry, such as Ideal. That all these cultivated varieties originated in the two species mentioned above has been, in the opinion of the author, confirmed by a detailed comparison of the morphological variations exhibited by the wild cherries on the one hand, and the morphological variations developed under the influence of cultivation in the cultivated cherries on the other. There is no evidence that the latter originated in *C. vulgaris*, or of any evolutionary connexion between the sweet and sour cherries. The wide range of forms which the wild cherry offers to the plant breeder and growers not only accounts for the existing cultivated cherries derived from those forms by means of selection and cultivation alone, but promises fruitful results from the hybridization of such forms with related species and genera. Hybrids with *C. avium*, *C. prostrata*, *C. incana*, and *Padus Maackii* have already been obtained. I. Z.

443. FLORY, W. S. (JUN.) 634.22:581.162.5
Crossing relationships among hybrid and specific plum varieties, and among the several *Prunus* species which are involved.
Amer. J. Bot. 1947 : **34** : 330–35.
Experiments to determine the crossing behaviour and effective pollenizing values of 37 plum varieties grown in the southwestern United States are described. It is pointed out that the Munson and Burbank plums, both of which possess an unusual number of good genetic characters, are compatible with a very large number of other varieties and are, therefore, to be recommended as parental varieties. The data obtained indicate that the ease of crossing between varieties is often closely correlated with the similarity of their botanical derivations. Effective pollenizers for *P. hortulana* are other *hortulana* and *Munsoniana* varieties; for *Munsoniana*, *hortulana* and *salicina* varieties; for *salicina*, most other non-hybrid varieties and a few hybrids; and for Asiatic-American species hybrids, native *angustifolia*, *Munsoniana* and often *salicina* varieties, and also the Asiatic hybrid Wickson.

444. 634.23
Description des principales variétés cultivées dans la région d'Orléans par ordre de maturité. **(Description in order of maturity of the principal varieties cultivated in the region of Orleans).**
Prem. Congr. Nat. Cerise, Orléans 1946 : 42–48.
An account is given of the characteristics of 17 cherry varieties.

445. 634.23:581.6
HART, R. 634.23:581.162.5
The new Merton cherries.
J. Pomol. 1947 : **23** : 112–16.
Five new cherry varieties, Merton Heart, Merton Bounty, Merton Premier, Merton Favourite and Merton Bigarreau are described (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1365). The first of these, which belongs to Crane's intra-incompatible Group VI, originated from the cross Bigarreau Schrecken x Elton Heart. It is a second early season variety, ripening about the same time as Circassian, is vigorous and upright, and gives a consistently heavy crop. The fruit is jet black when ripe with dark red, juicy flesh; it is large and heart shaped with a very rich flavour.
Merton Bounty, an early mid-season variety with a vigorous, upright and spreading habit, is from a cross between Elton and Bigarreau Schrecken. It gives, consistently, a moderate to heavy crop of purple, mottled fruit with pale crimson, juicy flesh. The fruit is large and heart shaped with a rich flavour. When unripe, it is superior to Governor Wood.

The origin of Merton Premier was Emperor Francis x Bedford Prolific. It is an early mid-season variety, ripening about the same time as Noir de Guben, with moderate vigour and an upright, spreading habit. It gives, consistently, a moderate crop of deep crimson-purple fruit of large size and Bigarreau shape and with dark red, firm flesh and a very good flavour.
Merton Favourite, which originated from the cross Knight's Early Black x Bigarreau Schrecken, is a mid-season variety, slightly earlier than Waterloo, moderate in vigour, much branched and spreading, similar to Waterloo. The fruit, of which a moderate to heavy crop is given, is large and oval with dark purplish crimson, juicy flesh and an excellent flavour; in colour, it is dark purplish crimson, darkening to jet black when fully ripe.
Merton Bigarreau, from a cross between Knight's Early Black and Bigarreau Napoleon, belongs to Group VI. It is a late mid-season variety, ripening about the same time as Napoleon. It is vigorous and spreading and gives a regular, heavy crop of large, Bigarreau-shaped fruit, deep mahogany in colour with firm, dark red flesh and a rich flavour.

446. Crane, M. B. 634.23:581.6:581.162.5
An extended trial of seedling cherries.
J. Pomol. 1947 : **23** : 109–11.
Trials of 14 seedlings produced for genetical study at the John Innes Horticultural Institution are reported. Five of them merited commercial introduction and have been named. Merton Bigarreau (193) was awarded a First Class Certificate and Merton Favourite (185), Merton Heart (404), Merton Premier (418) and Merton Bounty (490) received Awards of Merit. A limited amount of wood for budding purposes will be available in 1947. Pollination tests showed that Merton Bigarreau is in Group II and Merton Heart in Group VI. Merton Favourite will be compatible with Group I, Merton Premier with Group III and Merton Bounty with Group VI.

447. Kárpáti, Z. 634.23:582
Vizsgálatok a hazai *Cerasus* alnemzetségbe tartozó hazai Prunusokon. (**Experiments on *Prunus* species belonging to the genus *Cerasus***).
Bull. Hung. Coll. Hort. Vinecult. **1944** : **10** : 66–78.
The new varieties *P. avium* L. f. *spenophylla* Kárp. and *P. avium* L. f. *acuminatissima* Kárp., are described. The hybrid from the cross between *P. avium* and *P. fruticosa* is named *P. Mohacsyana* Kárp.
The morphology, distribution and origin of some other *Prunus* species are also discussed.
E. E.

448. Darpoux, H. 634.23–2.421.3–1.521.6(44)
Étude sur l'anthracnose du cerisier. (**A study of the anthracnose of the cherry**).
Ann. Épiphyt. 1945 : **11** : 161–75.
Lack of sufficient information makes it impossible to draw any very definite conclusions about the susceptibility to *Coccomyces hiemalis* Hig. of different varieties of cherry, as it is thought probable that the infection of trees already attacked the previous year is due as much to the persistence of the fungus as to the particular susceptibility of the varieties. The results are given, however, of observations of different varieties in Versailles from 1943 to 1945. One unnamed variety was found to be completely resistant.

449. Lott, T. B. 634.23–2.8(71.1)
"Small bitter cherry", a fruit abnormality of the Bing cherry variety.
Sci. Agric. 1947 : **27** : 260–62.
An abnormality, called the "small bitter cherry," has been observed in the fruit of the Bing cherry variety for several years in the Okanagan Valley of British Columbia. Its cause is unknown; and the abnormality has not been transmitted by tissue grafts. In itself small bitter cherry is not economically serious since few trees are affected, but the abnormality may possibly be confused with the little cherry disease.

450. BLAKE, M. A. 634.25:575(74.9)
The late variety of peach-plum for New Jersey.
Hort. News N.J. 1947 : **28** : p. 1986.

Work is being carried out at the New Jersey Agricultural Experiment Station to breed peach varieties which will mature satisfactorily after the ripening period of Elberta. The P.I. 35201 peach, introduced from China by the U.S. Department of Agriculture, is mentioned as a promising parent in this work.

The Brackett and Afterglow varieties ripen later than Elberta. Gemmer is another late maturing variety. It was recently developed from the cross N.J. 46225 x Laterose. Its edible quality is particularly good, but the variety has not yet been widely tested as a commercial peach.

451. JONES, T. H. 634.25:581.6(76.2)
Over 100 varieties of peaches in test in Station orchard.
Miss. Fm Res. 1944 : **7** : No. 8 : p. 7.

Of the more than 100 peach varieties under trial, 44 were harvested and evaluated in 1944. The varieties adapted to Mississippi conditions are indicated, in order of ripening. On the basis of data so far available, Early Hiley, Valiant and Vidette are added to the approved list.

Early Hiley is a white freestone similar in appearance and quality to Hiley but ripening about a week earlier. The other two are yellow freestone peaches ripening a few days ahead of Halehaven.

452. MAURI, N. 634.3(65)
Aide-mémoire du tailleur d'agrumes. (**Guide for the citrus pruner**).
Bull. Inspection Gén. Direction Agric. de l'Algérie 1946 : No. 127 : Pp. 51.

Notes are included on different varieties of orange, mandarin, clementine, lemon and pomelo, including the Double Fine and Portugaise oranges and the lemon Verña or Bedma lemon, grown in Algeria.

453. SIMONNEAU, R.,
MAURI, N.,
COSTE, A. and
BLONDEL, L. 634.3:581.6:575"793"(65)
A la recherche des variétés d'agrumes très précoces. (**Looking for very early citrus varieties**).
Ann. Inst. Agric. Serv. Recherches Exp. Agric. Algérie 1946 : **3** : 21–48.

An account is given of the origin of the Monréal Clementine which is commercially valuable for its early fruiting. Its characteristics as compared with the ordinary Clementine, and its response to different cultural conditions are described. Data concerning the morphology, time of maturity and chemical composition of the juice of Saïgon, another early variety, are also presented.

454. 634.322:581.165.71:576.16(52)
FAUVEL, J. H. 634.322:575.247
Le groupe des oranges-Mandarines "Satsuma". Études des variétés des porte-greffes et des mutations de rameaux. (**The Satsuma group of Mandarin oranges. Studies on varieties, stocks and bud mutations**).
Rev. Bot. Appl. 1946 : **26** : 119–26.

The six chief varieties of Satsuma mandarins are described. They are all derived from the variety Zaïraï or Chikugobeï which is over 300 years old and a native of Japan. The varieties Owari, Wase and Ikéda are of most interest to North African planters.

The influence of the stock on the Satsuma varieties, all of which must be grafted, is not thoroughly understood. The results of grafting experiments in Japan, America and North Africa are reviewed.

An account is given of bud mutations in different varieties. Wase and Owari can mutate one into the other.

455. Camp, W. H. 634.4–1.524(73)
Some additional comments on the naranjilla.
J. N.Y. Bot. Gdn 1947 : **48** : 159–60.
Some problems of the commercial production of the naranjilla outside its native habitat are briefly discussed (cf. Abst. 456). It is suggested that forms suitable for growing in the southern United States might be secured by selection.

456. Hodge, W. H. 634.4–1.524(73)
Naranjillas, or "little oranges" of the Andean highlands.
J. N.Y. Bot. Gdn 1947 : **48** : 155–59.
A general account is given of the naranjilla of Ecuador, *Solanum quitoense*, used for fruit juice and other purposes. Plants grown in sub-tropical Florida and California have produced abundant foliage but no fruits, suggesting that the photoperiodic conditions are unsuitable.

457. Mouat, H. M. 634.42:575.22(93.1)
Observations on seedling feijoas (*Feijoa sellowiana* Berg.) at Mount Albert, Auckland.
N.Z. J. Sci. Tech. 1947 : **28** : 335–37.
Observations on the growth, fruit production and fruit characteristics of seedlings of *F. Sellowiana* Berg. are reported. The seedlings showed considerable variability; it is recommended that in making new plantings growers should use trees worked with a scion variety of known performance.

458. Evreinoff, V. A. 634.462:581.6
Le caroubier ou *Ceratonia siliqua* L. (**The carob tree or *Ceratonia siliqua* L.**)
Rev. Bot. Appl. 1947 : **27** : 389–401.
The characteristics of the carob tree varieties of Cyprus, Côte d'Azur, Liguria, Sicily, Spain, Greece, Crete, Portugal, Cyrenaica and Tripoli are described.

459. MacDaniels, L. H. 634.5:575(73)
Where do we go from here?
36th Rep. Nth. Nut Gr. Ass. 1945 : 112–15.
Past and future aims of the Northern Nut Growers Association are discussed.

460. McKay, J. W. 634.5:575.125(73)
Value and use of hybrids in nut breeding.
36th Rep. Nth. Nut Gr. Ass. 1945 : 70–75.
The possible use of F_1 hybrids in nut breeding is discussed, reference being made to interspecific hybrids of *Carya, Juglans, Castanea* and *Corylus*.
Attention is also drawn to the need for investigating the effect of the male parent upon nut size and the vigour and productiveness of the resulting F_1 individuals.

461. Becker, J. and Maliga, P. 634.5:581.192:575(43.91)
Néhány hazai dio értékéről és minősitéséről. (**On the value and qualification of some Hungarian walnuts**).
Bull. Hung. Coll. Hort. 1944 : **10** : 86–93.
The authors investigated 27 different kinds of nuts. They obtained a negative correlation between the size of the nut and the size of the kernel. Oil and protein contents were found to be independent of nut size, but nuts with higher oil content have lower protein content and vice versa. The authors suggest the following minimum specifications for suitable nuts: medium size and a weight of 10–15 grms; at least 50% kernel; 40% oil protein expressed as percentage of weight of whole nut; and 60% oil content in the kernel. The authors believe that 75% oil content of the kernel can be attained by breeding. T. P. B.

462. GLENN, E. M., HATTON, R. G. and WITT, A. W. 634.51(42)
Some preliminary investigations on the growing of walnuts in England (1925–46).
J. R. Hort. Soc. 1947 : **72** : 269–74.
An account is given of investigations conducted at East Malling during the last 20 years on the suitability of walnut varieties for cultivation under English conditions, and on propagation by grafting and cultural methods.
Notes are included on the varieties found to be most promising among the 120 varieties collected at East Malling.

463. BERHOW, S. 634.512(73)
Black walnut variety tabulation.
36th Rep. Nth. Nut Gr. Ass. 1945 : 38–43.
Black walnut varieties in the United States are listed, useful information being given on origin, total kernel percentage and other features.

464. TATUM, W. G. 634.512(73)
The new "Victoria" black walnut.
36th Rep. Nth. Nut Gr. Ass. 1945 : 50–51.
A promising black walnut tree, named Victoria, has been found growing wild. It has yielded kernels with outstandingly good qualities, and tests are to be carried out on grafts and seedlings.

465. ATWOOD, S. S. and MACDANIELS, L. H. 634.512:519.271.3
Tests of black walnut varieties for differences in kernel yields.
36th Rep. Nth. Nut Gr. Ass. 1945 : 44–50.
The problems of a satisfactory technique of testing kernel yields in black walnut varietal testing were studied statistically. Several recommendations to provide accuracy in testing are put forward.

466. ZARGER, T. G. 634.512.00.14(73)
Nut-testing, propagation and planting experience on 90 black walnut selections.
36th Rep. Nth. Nut Gr. Ass. 1945 : 23–30.
The results are summarized of twelve years' work of testing 80 black walnut varieties in the Tennessee Valley.

467. HINRICHS, H. 634.512.00.14(76.6)
Black walnuts in Oklahoma.
36th Rep. Nth. Nut Gr. Ass. 1945 : 31–34.
Trials of black walnut varieties in Oklahoma are reported.

468. REED, C. A. 634.52(76.4)
The Aber hickory.
36th Rep. Nth. Nut Gr. Ass. 1945 : 67–70.
A tree known as the Aber hickory is described. It was found by E. A. Aber, Cherokee County, Texas, and it is suspected of being a red hickory [*Carya ovalis* (Wangh.) Sarg.]. The tree is highly prolific, and bears nuts with an attractive appearance, thin shell and sweet kernel. Its cracking quality, however, is unsatisfactory. The F_1 progeny of the tree are to be grown for further observation.

469. REED, C. A. 634.53(73)
The 1946 status of Chinese chestnut growing in the Eastern United States.
37th Rep. Nth. Nut Gr. Ass. 1946 : 51–58.
The Chinese chestnut (*Castanea mollissima*) and its use in the eastern United States are described. Notes on the following varieties are included: Abundance, Carr, Hobson, Reliable, Stoke, Yankee (Connecticut Yankee) and Zimmerman. Further varietal selection

is in progress, mainly from trees at the various field stations of the United States Bureau of Plant Industry.

470. Weschcke, C. 634.54:576.16:575.127.2
Proof of hybridity of Rush and Winkler Hazels.
36th Rep. Nth. Nut Gr. Ass. 1945 : 78–80.
Filbert-like characters are shown by the Rush and Winkler hazels, suggesting that these varieties are of hybrid origin.

471. Fanelli, L. 634.551(45)
Varietà pugliesi di mandorle. (**The almond varieties of the Puglia**).
Staz. Agrar. Sper. Bari 1939 : Pp. 235.
The almond has been grown for over twenty centuries in the Puglia province of southern Italy and a multiplicity of forms has arisen. The Commission for Almond Improvement has made a study of these forms and 367 varieties have been established, of which some 50 are classed as superior. Each zone has its characteristic varieties, and the marked environmental differences between zones make it improbable that standard varieties suitable for the whole province will be found. For each zone however the number of varieties recommended is limited to 3–4.
In this monograph descriptions are given of the 50 superior varieties, with data on the origin, synonyms, distribution, habit, form of vegetative and reproductive organs, reaction to frost, drought and diseases, time of flowering and maturity, oil content, yielding ability, and commercial quality. The remaining varieties are described in less detail.

472. Bouffil, F. 634.58:575.42(66.1)
Biologie, écologie et sélection de l'arachide au Sénégal. (**Biology, ecology and selection of the groundnut in Senegal**).
Bull. Sci. Minist. Fr. d'Outre Mer 1947 : No. 1 : Pp. 107.
This bulletin contains a discussion on the selection of groundnut plants. Various criteria have been tried and abandoned, and selection is now based on the inheritance of morphological characters of the fruits and on the 100 seed weight. Mother plants are chosen from a classified collection of plants kept for this purpose. The way in which the seed plants are grown and distributed is described.

473. Chevalier, A. 634.58:575.42(66.3)
Amélioration et extension de la culture des arachides au Sénégal. (**Improvement and extension of the cultivation of groundnuts in Senegal**).
Rev. Bot. Appl. 1947 : **27** : 173–92.
An erect variety, L.28–206, is stated to have a high seed density and large fruits, to be well adapted to the rainfall of the southern regions of Senegal, and to lend itself to mechanized production. In the south, a mixture of varieties 56 and 86 has given good results. The vegetative period of these varieties is from 88 to 116 days.
Some information is given about East African varieties, and the nature and results of the selection carried out (cf. *Plant Breeding Abstracts*, Vol. XVI, Abst. 1001).

474. Hoffpauir, C. L. and
Guthrie, J. D. 634.58:581.192
Chemical composition of peanuts. A literature review.
Peanut J. and Nut World 1945 : **24** : No. 6 : 26–29.
A survey is presented of the information available in the literature on the chemical composition of the groundnut, and the aspects which require further investigations are indicated.

475. Phillis, E. 634.61:575.42(72.98)
An outline for a coconut selection scheme.
Proc. Agric. Soc. Trin. Tob. 1946 : **46** : 155–59.
The great variation from one area to another in the yield per acre of coconut plantations in Trinidad is thought to be partly determined by genetic factors. It is proposed therefore to improve the quality of the trees by implementing a long range selection project, the outline of which is given in this paper.

476. 634.653:582:575.12
S....., P. 634.653:581.056
A propos des variétés d'avocatiers. **(Concerning varieties of avocados).**
Bull. Agric. Congo Belge **1946 : 37 : 665–66.**
The adaptation to climate of varieties belonging to the three groups, Mexican, Guatemalan and West Indian, is indicated. Hybridizations are possible between varieties belonging to different groups. The classifying of varieties according to their method of flowering is explained.

477. Einset, J. 634.71:576.312.35
Chromosome studies in *Rubus*.
Gentes Herbarum, Ithaca, N.Y. **1947 : 7 : 181–92.**
The methods used and the results so far obtained in a study of the chromosomes of the genus *Rubus* are described. With the exception of *R. strigosus* the plants studied belong to the subgenus *Eubatus*. Somatic chromosome numbers are reported for 26 species, all of which are euploids with exact multiples of 7 chromosomes except *R. Wiegandii* with $2n = 36$. The detailed morphology of the chromosomes of *Rubus* has not been worked out. They range from about 1 to 3 or 4 micra in length. No significant size differences were noted between the chromosome sets of different species. Irregularities at meiosis led to the formation of extra spores at microsporogenesis in all the plants studied except two of the diploid, 14 chromosome forms. The observed features of meiosis in 3 diploids, 3 triploids, 3 tetraploids, 2 pentaploids, an aneuploid and an enneaploid are described. The problems arising from this study provide scope for further research.

478. Bailey, L. H. 634.71:582:575.127.2
Species studies in *Rubus*.
Gentes Herbarum, Ithaca, N.Y. **1947 : 7 : 193–349.**
The value of chromosome studies in systematic work is discussed with particular reference to the genus *Rubus*. The author defends himself against the charge of having made too many species in his systematic treatment of the genus, on the grounds that he has never made a species but has only recognized and named them. There are still many *Rubus* species which await discovery and description.
It is pointed out that the dogma, widely accepted by systematists, that intermediateness indicates hybridity is not in accordance with Mendelian views, and that any conclusion that a plant is intermediate between two other species must be based on a thorough investigation. The tacit assumption that all *Rubus* species can interbreed is not based on experimental evidence. Spontaneous natural hybrids are considered by the author to be exceptional, and since their existence in the genus *Rubus* has not been proved, none of the species he describes are designated hybrids.
Previous work on the systematics of the genus is reviewed.
The following new species are described and illustrated: *Rubus Rowleei*, *R. Huttonii*, *R. Davisiorum*, *R. Parlinii*, *R. vagulus*, *R. zaplutus*, *R. furtivus*, *R. vegrandis* and *R. compos* in the Hispidi; *R. Boottianus*, *R. condignus*, *R. beatus*, *R. exter*, *R. tectus*, *R. suppar*, *R. angustifoliatus*, *R. racemiger*, *R. nocivus*, *R. quebecensis*, *R. stipulatus*, *R. Deaneanus*, *R. uniformus*, *R. singulus*, *R. Benneri* and *R. hispidoides* in the Setosi; *R. Macvaughii*, *R. lassus* and *R. uncus*, in the Verotriviales; *R. uniflorifer*, *R. eflagellaris*, *R. setospinosus*, *R. polybotrys*, *R. Sailori*, *R. maniseesensis*, *R. currulis*, *R. vixalacer*, *R. noveboracus*, *R. problematicus*, *R. Pohlii*, *R. Rosendahlii*, *R. onustus*, *R. prior*, *R. botruosus*, *R. injunctus*, *R. particularis*, *R. Housei*, *R. largus*, *R. pityophilus*, S. J. Smith, *R. densipubens*, *R. redundans*, *R. Macdanielsii*, *R. jactus* and *R. Sanfordii* in the Flagellares; *R. monongaliensis*, *R. illustris*, *R. forestalis*, *R. perdebilis*, *R. irregularis*, *R. Besseyi* and *R. Darlingtonii* in the Canadensis; *R. tumularis*, *R. campester* and *R. reravus* in the Alleghenienses; *R. associus*, Hanes, *R. senilis*, *R. independens*, *R. bractealis*, *R. valentubus*, *R. humilior*, *R. texanus* and *R. populus* in the Arguti; and two Latin-American species, *R. breviglandifer* and *R. hondurensis*. *R. junceus*, Blanchard var. *regionalis*, Bailey *R. vermontanus* var. *viridifolius*, Blanchard and var. *viridis*, Blanchard, and *R. prosper* var. *cordifrons*, Bailey are raised to specific status as *R. regionalis*, *R. viridifrons* and *R. cordifrons* respectively. Reference is made to other recent additions to the genus.

479. HARRIS, R. V. 634.711–2.8–1.521.6
Norfolk giant raspberry, a reliable variety for the present day.
Fruit Gr. Fruiterer, Flor. and Market Gdn. 1944 : **98** : 81–82, 98.
The superiority of the raspberry variety Norfolk Giant over Lloyd George, in spite of its greater age, is attributed to its natural resistance to virus diseases and to the fact that when it is infected, the symptoms are so easily detected that eradication is facilitated. Reference is made to the virus resistance of some other varieties.

480. 634.722.00.14(49.2)
634.723.00.14(49.2)
Bos, J. 634.725.00.14(49.2)
Ervaringen met bessen op den proeftuin "Boom en Vrucht" te Kesteren. (**Variety trials of currants and gooseberries in the experiment garden "Boom en Vrucht" at Kesteren**).
Fruitteelt 1946 : **36** : 174–76.
This garden was planted in 1941 with the following varieties: 10 varieties of black currants, 10 of red currants and 6 of gooseberries.
Yields per bush for the years 1942–44 inclusive are reported with notes on the varieties. A warning is given that several of the names under which the varieties are reported are incorrect. A much greater number of bushes of the black currant varieties Baldwin and Westwick's Choice can be grown per acre than of the other varieties; since they give a good yield per bush, the yield per acre should be very high.
Attention is drawn to the remarkable fact that the red currant Laxton's No. 1 (7¼ lb. per bush) yielded more than the best of the black currants (Westwick's Choice 5 lb. per bush). The difference in time of plucking for the earliest and latest varieties is about 3 weeks for the red and 2 weeks for the black currants and about 3 weeks for the gooseberries. C. B.

481. WHITE, E. C. 634.73:575(73)
Cultivated blueberries.
Plants and Gardens, Brooklyn 1947 : **3** : 41–48.
An account is given of pioneer experiments carried out by the author in co-operation with F. V. Coville on the cultivation, propagation, selection and breeding of the blueberry in the United States.

82. ERKELENS, M. A. 634.75–1.521.5(49.2)
De keuring van aardbeiplantmateriaal. (**Certification of strawberry plants**).
Fruitteelt 1946 : **36** : p. 220.
Certification has been possible for some years but since 1943 it has been entrusted to the Nederlandsche Algemeene Keuringsdienst voor Boomkweekerijgewassen [General Certification Service for Nursery Plants] in order to obtain more uniformity. As from May 1948 no plants not approved by N.A.K.B. may be offered for sale. Inspectors will carry out two to four field inspections to determine the health, fruitfulness and other important characters of the varieties. The requirements for certification have been published. Stocks will be classed as AA, A, B, or N; the latter only if insufficient material of higher class is expected. Class AA is restricted to material grown by selected firms, which must satisfy special requirements and will play an important role in improving the stocks. Plants to be classed as AA or A must be grown with fixed distances between mother plants and at a distance from any strawberries which suffer from root rot, virus or mites. C. B.

483. KRONENBERG, H. G. 634.75–1.521.5(49.2)
De selectie van aardbeiplanten. (**Selection of strawberry plants**).
Fruitteelt 1946 : **36** : 242–43.
Among the existing varieties it is still possible to find a reasonably healthy plant here and there which stands out well above the general level of quality of the rest. These can be disinfected with methylbromide, multiplied and selected in isolated gardens. The intention is to carry out such a selection outside the strawberry growing districts. Such selected plants which alone are eligible for AA certificates will not be sold direct but first multiplied by special growers also located outside the strawberry districts if possible. C. B.

484. CHANDLER, F. B. 634.76–2.8–1.521.6:575.12
Cranberry breeding investigations in 1944.
Proc. Amer. Cranb. Gr. Ass. 1944 : **75** : 16–17.
Cranberry breeding was begun about 1930 with the aim of producing new varieties resistant to false blossom. McFarlin and Early Black were used as parents for most of the crosses. Selections from the progenies are being tested and several of them appear promising. Shaw's Success has proved more resistant than McFarlin to false blossom. Of the 17 crosses that are giving a relatively large number of high yielding plants, 16 have McFarlin or Shaw's Success as one parent. Sixteen named varieties have been used as parents and over 10,000 plants have been set in the seedling nursery at Whitesbog.

485. JACOB, K. C. 634.771(54.8)
A note on the cultivation of bananas in the Madras presidency.
Madras Agric. J. 1939 : **27** : 199–202.
A descriptive list of commercial varieties is given.

486. 634.771:575(72.92)
Abbreviated reports of technical officers.
Rep. Dep. Agric. Jamaica 1946 (1947) : 9–11.
The following breeding and genetical investigations on the banana are reported:
Established breeding lines of primary crosses of edible triploid x diploid have been continued with certain modifications; Gros Michel x Pisang Lilan is the most promising of these primary crosses.
Crosses which have hitherto proved sterile, e.g. Gros Michel x *Musa Balbisiana*, Giant Governor x various diploids, Gros Michel x *M. nagensium* and Gros Michel x *M. rubra*, have continued to show sterility.
F_2 crosses have yielded seedlings valuable for the production of an improved male parent for primary crossing. Only a limited number of F_2 lines is now being continued, for the purposes of genetical investigation.
Among the new seedlings obtained, 20 initial selections have been made, of which half are derived from the cross Gros Michel x Pisang Lilan, and a quarter are the product of F_2 crosses. With the exception of the one family of the cross Gros Michel x Pisang Lilan, recently obtained seedlings show little improvement over seedlings secured earlier in the breeding programme, indicating that the potentialities of existing breeding lines are rapidly approaching exhaustion.
Tests for resistance to Panama disease of the selected seedlings at an early stage of multiplication are being continued. Inbred families are also being examined for resistance, in the hope of determining the genetic basis of resistance. In the majority of cases resistance appears to be dominant to susceptibility, but the precise mechanism of genetic control of reaction to the disease has so far defeated analysis; it is probable that modifying factors are involved.
Cytological studies have been carried out on diploid, triploid and tetraploid clones of *Musa*, in relation to problems of breeding behaviour (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 870–1).
Somatic chromosome counts of seedlings of new and incomplete families have been resumed, as a check on parental behaviour. Counts of phenotypically abnormal seedlings have revealed two more F_1 diploids, of the parentage triploid x diploid, which should prove valuable in the synthesis of an improved male parent.
The production of polyploids by colchicine treatment is receiving attention. Various treatments of seed prior to sowing and injection into buds have so far been unsuccessful; treatment of germinating seedlings is now being attempted.
Complete failure to secure seed from the Cavendish group of varieties including the Dwarf, Giant Governor, Lacatan and Robusta bananas is not fully explicable on the basis of chromosome behaviour. It has been found that, when applied to the stigmas of the Cavendish variety, various pollens germinated but penetration of the style by pollen tubes occurred in only one case, indicating physiological incompatibility as the cause of the observed sterility. The single exception is being further investigated.

487. Carter, W. and Collins, J. L. 634.774–2.7–1.521.6:575(96.9)
Resistance to mealybug wilt of pineapple with special reference to a Cayenne-Queen hybrid.
Phytopathology 1947 : **37** : 332–48.

Tests of resistance to mealy bug wilt caused by *Pseudococcus brevipes* (Cke.) were carried out on the following pineapples: Cayenne Red Spanish, *Ananas ananassoides*, Pernambuco, Queen, Sarawak, Congo, Natal, MacGregor, Ruby and Monte Lirio. The Cayenne variety has proved to be most susceptible. A study of F_1 hybrids obtained from crosses between Cayenne and several of the above mentioned varieties showed that susceptibility to mealy bug wilt is a dominant character. Detailed investigations were carried out on the resistant hybrid No. 7898, selected in 1928 from the F_1 cross of Cayenne x Queen; this hybrid develops only mild leaf symptoms under conditions of bug infestation which cause severe symptoms in Cayenne. The effect of the source of the mealy bugs, the removal of excess ratoons and other factors upon wilt symptoms and susceptibility to infestation were studied. The F_2 generation of the hybrid between No. 7898 and No. 8597 (F_1 clone of Cayenne x Pernambuco) segregated for resistance in a monogenic ratio.
Four methods of testing for mealy bug wilt resistance are described.

488. Steuk, W. K. 634.8–1.524:575.127.2(73)
French-American hybrid grapes.
Bi-m. Bull. Ohio Agric. Exp. Sta. 1946 : **31** : 186–87.

An account is given of the French-American hybrid grapes developed in France primarily by hybridizing the European grape *Vitis vinifera* and American species. Among the American grapes used for hybridization *V. riparia*, *V. rupestris* and *V. Lincecumii* have been the chief species used.
A number of these hybrids are being grown in the United States, usually in test vineyards. A few commercial plantings of Seibel 1000, however, are now in bearing, and the Baco 1 variety is ready for limited planting.
In general the hybrids have responded well to American conditions. They have inherited the winter hardiness of the American species. As regards disease resistance they have shown more resistance than standard varieties of the eastern United States in limited tests. They appear, however, more susceptible to injury due to the grape leaf hopper (*Erythroneura comes*) and the grape berry worm (*Polychrosis viteana*).

489. 634.835:581.162.52:582:001.4(46.9)
Sousa, L. de O. Mendes da Costa e.
Casos de sui-produtividade nalgumas castas de uvas de mesa. (**Cases of self-fertility in some varieties of dessert grapes**).
An. Inst. Sup. Agron. Lisboa 1942 : **13** : 83–98.

Bunches of grapes, in no way inferior to the normal, have been obtained after bagging a series of Portuguese dessert grape varieties. In some cases, the anthers were removed in addition, but since it is uncertain whether or not emasculation was complete, no decision can be reached on the possible occurrence of parthenocarpy.
Alicante Encardo [Pink Alicante] is a synonym of Alicante de Málaga; Sultana is a synonym of Sultanina à Gros Grains [Large Berried Sultanina].

490. Agnel, H. and 634.835:581.165.71:578.08(44)
Galet, P. 634.835:581.165.71:578.08(65)
Les porte-greffes. (**Stocks**).
Ann. Éc. Agric. Montpellier 1946 : **27** : 161–203.

This paper contains a glossary of the terms used, descriptions of the six species *V. Labrusca*, *V. riparia*, *V. rupestris*, *V. Berlandieri*, *V. candicans* and *V. cordifolia*, keys for the identification of species and interspecific hybrids and of varieties of stocks, an account of the distinctions between similar varieties, and tables showing the origin of cultivated hybrids and the areas of cultivation of varieties in France and Algeria.

491. 634.835:581.165.711:582:001.4(46.9)

Sousa, L. de O. Mendes da Costa e.

Alguns aspectos do melhoramento em viticultura. (**Some aspects of improvement in viticulture**).

An. Inst. Sup. Agron. Lisboa 1941 : **12** : 181–204.

In this review of Portuguese viticulture, special mention is made of investigations on stocks and their suitability for bearing various scion varieties. The need is also pointed out of reducing to order the present confused synonymy of the Portuguese vines.

492. Levadoux, L. 634.835:581.46:577.88:575.11

Etude de la fleur et de la sexualité chez la vigne. (**A study of the flower and of sexuality in the vine**).

Ann. Éc. Agric. Montpellier 1946 : **27** : 1–89.

After reviewing previous literature on the subject, the author describes the different types of vine flowers and explains how they are grouped in individual plants and in different varieties. A study of the pollen of male vines revealed no correlation between the percentage of atrophied grains and the type of flower. The hermaphrodite and male plants possess certain common characters which separate them from the females. Some plants, which are sometimes considered intermediate between hermaphrodites and males, have normal pollen, but produce fruits with very few seeds. The inheritance of this condition of apyrenia is discussed. It is controlled by two independent pairs of allelomorphs and can arise by mutation. It seems therefore that apyrenia is not a sexual character, for sex is controlled by a single pair of allelomorphs. The problem of sex determination is discussed, and the conclusion is reached that sex is determined partly by inheritance and partly by the influence of external conditions. An attempt is made to interpret genetically the results of various crosses involving males, females and hermaphrodites. The practical applications of the information presented are discussed.

493. Vasconcellos, J. de Carvalho e. 634.835:582

Sistemática na "Vitis vinifera" L. (**Systematics of *V. vinifera* L.**).

An. Inst. Sup. Agron. Lisboa 1942 : **13** : 69–81.

The various classifications put forward for vine varieties are reviewed, and mention is made of the principles upon which a satisfactory treatment should be based.

FORESTRY 634.9

494. 634.9:575.1

Fifth British Empire Forestry Conference Great Britain, 1947.

His Majesty's Stationery Office, London 1947 : Pp. 56.

The problem of genetic work in forestry was discussed, and it was recommended that special attention be directed to the importance of genetics, among other things in the setting up of a comprehensive programme of research.

495. 634.97(41)

Forest tree breeding.

Scot. For. 1947 : **1** : 21–22.

Forest tree breeding has so far received hardly any attention in Scotland. Attention is drawn to its importance in improving stock, with brief reference to the hybrid between *Pinus Strobus* and *P. monticola* reported from America, and other investigations in foreign countries.

496. 634.97:575(47.1)

Finsk stiftelse för växtförädling av skogsträd. (**Finnish foundation for the breeding of forest trees**).

Svensk PappTidn. 1947 : **50** : p. 157.

Representatives in Finland of forestry and agricultural organizations and industries concerned with forest tree breeding met last February and decided to form an institution for forest tree breeding. An interim committee was appointed under the chairmanship of Professor N. A. Osara with R. Sarvas as Secretary. The committee included R. E. Serlachius.

497. 634.97:575(48.5)

*Årsberättelse över Föreningens för växtförädling av skogsträd verksamhet under år 1946. (**Annual report on the work of the Association for Forest Tree Breeding during the year 1946**).
Medd. Fören. Växtföräd. Skogsträd 1947 : No. 44 : Pp. 38.
Medföljer Svensk PappTidn 1947 : **50** : No. 7.

As in previous years, co-operation was maintained with the State Forestry Research Institute [Statens Skogsförsöksanstalt] and other official and unofficial bodies already mentioned in *Plant Breeding Abstracts*, Vol. XVI, Abst 946. The type determinations in untouched spruce stands were completed and the results received from Ekebo and the Central Laboratory of the Cellulose Industry of chemical analyses of sample trees will now be compared. The international larch provenance study entrusted to the Association is proceeding. Many private firms and individuals gave grants or co-operated in various ways with the Association.

Seed and grafting material was also received from Denmark (including some scion cuttings from the first triploid larches in Horsholms Arboretum) and Canada.

C. L. Kiellander's report for 1946 on the work of the main institute and its branch stations contains the following information:—

Spruce

Studies were made of the progenies obtained from the different sowings carried out in 1946, 1945, 1944, 1943 and 1942. Selection for cold resistance is being continued.

It is hoped to plant the tetraploid or partly tetraploid spruces of 1941 and 1942 in 1948. So far they appear greatly inferior to the diploid normal plants, but a final judgment can only be made when a purely tetraploid progeny is obtained.

The 1945 colchicine treatment resulted in many more or less pure tetraploids from an élite stand at Alvan.

In grading 2/0 spruce a score or so of thick-needled plants were found, which probably had aberrant chromosome numbers; some may be polyploids.

Pine

Nearly all the 1941–45 pine grafts flowered every, or every second year. Though cones were not very abundant, the grafts (and especially the one-year-old ones) produced plenty of pollen.

Colchicine treatment was continued. Stomata measurements were made on the plants raised after the previous year's treatment, and it was found that, as in spruce and Siberian larch, in all likelihood some pure tetraploids had been produced, but also many with tetraploid-diploid tissue. The two-year-old pine "tetraploids" are not as backward as the tetraploid spruces, in comparison with the diploids.

Larch

Grafting has been done with scions from *Larix decidua*, *L. sibirica*, *L. leptolepis*, *L. Gmelini*, and *L. occidentalis*. Experiments were made to ascertain the effect of the growing conditions of stocks of different species upon the future annual time of flowering and whether any such differences could be used in breeding.

A progress report is given on the grafts made during 1942–45.

In an international provenance trial, a severe and persistent attack of *Meria laricis* revealed the presence of completely resistant numbers of *L. leptolepis* in 1945, and in 1946 also of many such individuals among the *L. decidua* from certain regions. These trees were much taller and stronger than the others, partly owing to heterosis, due to natural hybridization between *L. decidua* and *L. leptolepis*.

Hybridization between *L. decidua* and *L. leptolepis* was carried out on a fairly large scale.

Colchicine treatment of *L. sibirica* from Punkaharju produced, according to stomata measurements, 29 mixoploids, 31 probable, pure tetraploids and 76 unaffected plants (diploids). The difference between diploid and tetraploid needles was very clearly marked, exactly as in spruce.

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* An extended summary of this paper is on file at the Bureau.

Other Conifers

The year's work has consisted mainly in continuing the cultivation of various species and material from different localities, e.g. the transplantation at Ekebo of different numbers of *Abies, Pinus, Pseudotsuga, Chamaecyparis* and *Thuja*. Winter-hardy stocks of *Pseudotsuga taxifolia* stocks are being raised in pots for observational and breeding operations. The hybrid *Picea sitchensis* x *P. glauca*, produced in 1942 at Kiviks Esperöd, was planted out in field experiments at Björnstorp for comparison with 35 different numbers of German spruce.

H. Johnsson gives the following report on breeding of different deciduous trees and laboratory investigations at Ekebo:—

Aspen and Poplars

The variety test at the Svensk Tändsticksaktiebolaget [The Swedish Match Co., Ltd.] experimental estate has done well and has been amplified by three new experiments comprising 7000 plants. It includes diploid and triploid poplar crosses between the Swedish and Canadian poplar.

Poplar crosses made in spring 1946 included a few tetraploids and Canadian poplars, pollen of the latter species having been received from Canada. From a total of 17,800 plants, 10,000 should be ready for grading and planting next spring.

The so-called, rooted stem-cutting method was used for vegetative multiplication of about ten different trees, diploids and triploids, to provide material for testing the value of the trees on a larger scale.

An experiment is in progress to test the reaction of the various poplar hybrids to *Fomes igniarius*.

Birch

A progress report is made on the experimental plantations (about 15,000 trees) laid down in 1942 and 1943 at Ekebo and Kolleberga, which are continuing to exhibit more distinct differences between the progeny.

A detailed study was made of the "curly" character in the stem and timber of the curly birches in the experiment planted out in 1943.

The small amount of material ready for planting in field experiments in spring 1946 consisted of hybrids, but a total of 321,600 plants, comprising 126 families, were raised in the nurseries.

In spring 1946, 26 selected parent trees of warty birch [vårtbjörk from Scania and Holland and of flamy birch [flambjörk] from Västergötland and Småland were grafted in the greenhouse. Most of the flamy birch used in breeding is of exceptionally good quality with the characteristic "flamy" figure extending right up to 14 feet. A large number of birch crosses were made in the greenhouse in spring: the seed from 19 should give about 75,000 plants.

Alder

Transplanted progenies ready for planting in field trials consist of 123 families and 47,300 plants, 800 of which are from crosses made in 1945. Two of these offspring are triploids, derived from *Alnus glutinosa* in one case and *A. incana* in the other, crossed by foreign Species; one is slow growing, and the other vigorous.

Brief notes on work with oak, ash, elm and beech include the following.

Grafts of élites of ash, beech and elm were made. For ash the so-called "hand-graft" method (in which the newly made grafts are planted directly in the open) was used with success.

Three triploid oak plants with 36 chromosomes were produced by the twin method though their growth capacity and other features cannot yet be estimated. In the meantime they will probably be very useful for oak breeding.

Laboratory investigations at Ekebo included chromosome determinations of poplars, of interspecific hybrids of birch and alder, and of twin oaks and beeches. Three oak triploids were discovered.

E. Stefansson of the Norrland Station at Sundmo gives the following report for the year on matters relating to plant breeding.
Grafting operations were concentrated on pine. Out of 1250 grafts made, 1109 survived. Incidentally experiment has shown that with proper organization the special frames for raising the young plants can be used for fresh batches of grafts several times in the season.
Spruce grafts numbered 550 of which only 42% had survived by September.
Free-planting has been shown to be a good and cheap method for over-wintering young grafts.
Seed from 549 mother pines sown in spring produced about 40,000 plants. Investigations, not yet completed, suggest that there may be a positive correlation between size of seed and of the resulting plant. Laboratory experiments also showed that heavy seeds invariably gave bigger plants than light ones.
Possibilities and the difficulties of selecting and grading young plants to obtain genotypically superior material for afforestation are briefly discussed with reference to the two main factors, heredity and environment. Environmental factors affecting plant type as based on the genotype are size of seed and density of sowing. The difficulties are regarded as too great under ordinary nursery conditions, but once the selective influence of the micro-milieu can be eliminated, plant selection will become more reliable and may become important as a method of race improvement.
Spruce seed of 8 different origins was used in comparing germination in the soil and germination in Jakobsen's apparatus. In this test and the previous one, the germination percentage was higher in the apparatus for all varieties and the difference increased as the height above sea level of the varieties in the collection increased.
Special mention is made of a magnificent birch *Betula verrucosa* from Medle in Västerbotten which had uncommonly thick and large leaves for the species, and exhibited a greater variation in the size of the pollen grains than is usual in birches. The germination percentage was very low. These features suggest triploidy and further investigations will reveal whether the tree was a "giant" type. Another remarkable specimen was a felled, flamy birch [flamvedsbjörk], measuring 10 inches at breast-height with the fine flamy figure extending to a height of 8 metres. Five grafts from this tree will maintain the type for future breeding.
In spite of abundant flowering of aspens, flower buds were often lacking on the best specimens. Grafts were therefore taken from three trees and now bear large numbers of floral buds.
Chromosome determinations are in progress with plants from Rosinedal (triploid) x Junsele (diploid) and the highest chromosome number so far recorded is 54.
Effects of harvesting and of artificial shade on the seed crop from pine are being studied.
Infection tests have been begun as planned by E. Björkman to detect any possible races of pine that are resistant or susceptible to snow blight.
A full report is given by E. Runquist of the extensive work done at Dalfors Branch Station on pine spp., spruces, birch and other conifers and deciduous trees including studies of poplar hybrids.
Enar Andersson records investigations in field and laboratory on birch spp., on hybridization work and colchicine treatment of conifer seed and pollen examinations of spruce and pine; and cytological studies of various problems.
C. L. Kiellander records the activities of the Östgöta Station with spruce, pine and larch, etc. Progeny tests of pine and spruce are in progress.

498. Riker, A. J. 634.97–1.521.6:575
Resistance to disease in trees.
Amer. Nurserym. **1945** : **81** : No. **12** : **5–7.**

The means of disease resistance in trees are briefly discussed. A general method of breeding resistant varieties by selection from local and foreign material, hybridization, treatment with ultraviolet light and colchicine is described. Reference is made to the development of resistance to chestnut blight, Dutch elm disease, phloem necrosis of elms, oak wilt, cedar-apple rust and white pine blister rust.

499. Puri, G. S. 634.972.3:56:581.9
Lombardy poplar (*Populus nigra* Linn. var. *fastigiata* Desf.) in India.
Indian For. **1945 : 71 : 423–25.**
The discovery in the Karewa deposits of Kashmir of a few well preserved leaf impressions, specifically identical with modern leaves of the Lombardy poplar, is reported. Various views about the origin of this variety are cited, and its modern distribution is outlined. It is contended by the author that it has continued to exist in Kashmir since the Pleistocene.

500. Dominique, F. 634.972.3:575.127.2
Notes sur un peuplier hybride, le *Populus Jackii*. **(Notes on a hybrid poplar, *P. Jackii*).**
Ann. Ass. Canad. Fr. Advanc. Sci. Montréal **1936 : 2 : 63–64.**
The discovery of a completely fertile tree of *P. Jackii* with perfectly developed fruits throws some doubt on its reputed origin as a hybrid between *P. balsamifera* and *P. Tacamahaca*.

501. 634.972.3:575.127.2(44)
Guinier. 634.972.3:575.247(44)
La question des peupliers. **(The question of the poplars).**
C.R. Acad. Agric. Fr. **1947 : 33 : 360–63.**
The history of the poplar species found in France is traced. Hybridization, which happens easily in this genus owing to the trees being dioecious and the different species interbreeding, has occurred at various times and is still occurring. The hybrids often show heterosis. Some new forms have arisen through bud mutations which are not infrequent in poplars.
Work on the nomenclature, definition and description of these numerous forms, on the artificial production of mutations, and on the disease resistance of different varieties is indicated as a future line of research.
A start has already been made on investigations along some of these lines by the Poplar Commission of France and the results will be utilized by the newly created International Poplar Commission.

502. Rouleau, E. 634.972.3:575.127.2(71)
Quelques peupliers hybrides de la région de Montréal. **(Some hybrid poplars in the Montreal region).**
Ann. Ass. Canad. Fr. Advanc. Sci. Montréal **1943 : 9** : p. **103.**
The author has discovered two new poplar hybrids which have not been described before. Both have *Populus Tacamahaca* for one parent. The identity of the other parents cannot be definitely determined until flowers of the hybrids become available.

503. 634.972.3–1.524(68)
634.975–1.524(68)
Annual Report of the Department of Forestry, Union of South Africa for the year ended 31st March, 1946 (1947) : Pp. 30.

Populus
Cuttings of poplar hybrids introduced from the United States are under test.
Cuttings of the semi-evergreen Lombardy poplar from Chile have been successfully established; this new strain should prove useful as windbreak species in the winter rainfall region of Cape Province.

Pinus
The results of field trials of rooted cuttings of *P. insignis* suggest that vegetatively produced planting stock is likely to be as hardy as seedling material. These results advance the prospects of genetic research in the winter rainfall region of the Union. Efforts to raise cuttings failed in the Transvaal high veld.
Begun in 1937, the work of testing geographical strains of *P. Taeda* and *P. caribaea* in Eastern Transvaal, Natal, Zululand and the Midlands, has been continued. Very marked and consistent differences in vigour are observable between strains of *P. Taeda*, but differences between strains of *P. caribaea* are negligible. A British Honduras strain of the latter species, however, shows superiority over the best strains used for local afforestation.

504. Newcomer, E. H. 634.972.3–1.524:575.12(75.6)
A three-year trial of hybrid poplars in North Carolina.
J. Elisha Mitchell Sci. Soc. **1946** : **62** : 77–80.

Plantings of cuttings of 67 hybrids and pure species of *Populus* were studied during a three-year period in two contiguous field sites and a hill-side plot at Chapel Hill, North Carolina. The majority of the selections were obtained from Michigan. The trees gave a poor growth, apparently failing to respond to the longer growing season and warmer climate of North Carolina. The author therefore suggests that less dependence should be placed upon the introduction of new material, and that selection and breeding based upon the most suitable species available in the southern United States should be encouraged.

505. Graves, A. H. 634.972.4–2.421.9–1.521.6.575.127.2(74.7)
Breeding work toward the development of a timber type of blight-resisting chestnut: Report for 1945.
36th Rep. Nth. Nut Gr. Ass. 1945 : 53–61.

An account is given of breeding work in progress at the Brooklyn Botanical Garden to develop blight (*Endothia parasitica*) resistant chestnuts, by crossing resistant Asiatic species with the American chestnut (*Castanea dentata*). Hybrids of Japanese (*C. crenata*) and American chestnut crossed with the Chinese species (*C. mollissima*) have so far given the most satisfactory results.

506. 634.972.5:582
Kárpáti, Z. 634.973:582
Dendrológiai jegyzetek. (**Notes on dendrology**).
Bull. Hung. Coll. Hort. Vinecult. **1944** : **10** : 162–71.

The occurrence of the hybrid *Salix Schumannia* Seeman in Transylvania is recorded.
Three new varieties of hornbeam are described, viz. *Carpinus Betulus* L.f. *corylifolia* Kárp., f. *Domokosiana* Kárp. and var. *Tuzsoni* Kárp. f. *acutidens* Kárp. The differences between *Carpinus Betulus* L. f. *Haynaldiana* Borb. and var. *Tuzsoni* Kárp are discussed.
A key for the identification of Hungarian beech varieties of *Fagus moesiaca* in the Vértes mountains are given. Two new varieties *F. moesica* f. *Andreanszkyana* Kárp. and *F. sylvatica* f. *Javorkae* Kárp. are described. E. E.

507. Lindquist, B. 634.972.6:582
Two species of *Betula* from the Iceland Miocene.
Svensk. Bot. Tidskr. **1947** : **41** : 339–53.

After explaining his views on the taxonomy of fossil birches, the author describes birch remains consisting of five leaf fragments, four catkin scales and one branchlet from the Iceland Tertiary, collected by T. Thoroddsen in 1888 at Þrimilsðalur. Since there is no taxonomically acceptable name for the type of leaf represented by four of the leaves examined, this type is described as a new species, *B. cristata*. Similarly, the type of catkin scale to which two of those examined belong is described as another new species, *B. subnivalis*. The ways in which the Þrimilsðalur material corresponds to some European *Betula* species is pointed out. Comparison of the catkin scales of *B. subnivalis* and the recent *B. callosa* show that a digitate type of catkin scale in the fossil material need not mean that these fossil species should be referred to section *Costatae*. The author considers that *B. nivalis* should properly be assigned to section *Nivales*. In view of the finds at Þrimilsðalur it is stated that the *B. callosa* type of birch has not changed morphologically since the Miocene and most probably has existed in the Scandinavian flora ever since then.

508. 634.972.7–1.524(43.91)
Wagner, J. 634.972.7:582
Magyarország hársai. IV. A honosított hársak. (**Hungarian limes. IV. Introduced limes**).
Bull. Hung. Coll. Hort. Vinecult. **1944** : **10** : 13–29.

A description is given of *Tilia euchlora, T. magyarica, T. americana, T. heterophylla, T. monticola*, and their varieties; and their origin is discussed. A new species *T. Mohácsyana* is also described.
An appendix is included listing 850 described species. E. E.

509. Puri, G. S. 634.972.8:56:581.9
Some fossil leaves of the Ulmaceae from the Karewa deposits of Kashmir.
J. Indian Bot. Soc. 1945 : **24** : 183–90.
Fossil leaves of three *Ulmus* species, *U. Wallichiana*, *U. campestris* and *U. laevigata* and a leaf fragment which could not be determined specifically are described. An account is included of the modern distribution of the Ulmaceae and particularly of the species also found as fossils.

510. Greenway, P. J. 634.973(67.8)
Mahogany in East Africa. 1—The Khayas.
E. Afr. Agric. J. 1947 : **13** : 8–14.
An account is given of *Khaya anthotheca*, *K. grandifoliola*, *K. nyasica* and *K. senegalensis*.

511. Sax, H. J. and
Sax, K. 634.973:575.127.5:576.356
The cytogenetics of generic hybrids of Sorbus.
J. Arnold Arbor. 1947 : **28** : 137–40.
Descriptions are given of the morphology and course of meiosis in hybrids of *S. americana* x *Aronia prunifolia*, *S. Aria* x *Aronia arbutifolia*, *S. Aria* x *Aronia melanocarpa*, *S. scopulina* x *Amelanchier florida* and *S. Aria* x *Pyrus communis*. A few other intergeneric hybrids are under cultivation, but have not yet been analysed cytologically. All the hybrids are at least partially sterile and in all meiosis is irregular. Descriptions of F_2 segregates are included.

512. 634.975:575
Sherry, S. P. 634.975–1.524(68)
The potentialities of genetic research in South African forestry.
Brit. Emp. For. Conf. Un. S. Afr. 1947 : Pp. 11.
The present position of forestry in South Africa is outlined, and the need for a planned programme of genetic research in conjunction with the Union's post-war scheme of afforestation is stressed.
Genetical research on forest species has been carried out by various workers in South Africa since 1927. Summaries are given of the results of investigations on regional forms of *Pinus Pinaster*, *P. caribaea*, and *P. Taeda*; progeny tests of *P. radiata*; nursery selection of *P. palustris*; breeding experiments including the selfing of *P. radiata* and Portuguese and Corsican forms of *P. Pinaster*, hybridization between *P. radiata* and *P. Pinaster* and between the Portuguese and Corsican forms of *P. Pinaster*; breeding investigations on black wattle (*Acacia mollisima*) and green wattle (*A. decurrens*); and vegetative propagation, with particular reference to field plantings of rooted cuttings of *P. radiata*.
Forms of *P. Taeda* from certain localities in the southern United States and the Portuguese form of *P. Pinaster* have proved to be superior under South African conditions to other forms of the same species. Progenies from the seed of *P. caribaea* collected from different localities in the United States have not shown clinal variation. The stock of this species from British Honduras, however, appears to be a clinal form, and it has grown twice as fast as *P. caribaea* trees derived from sources in the United States.
Mother tree selection in *P. radiata* has given promising results. Vigorous individuals, mainly hybrids (*P. Sondereggeri*) between *P. palustris* and *P. Taeda* as male parent have been isolated among seedlings of *P. palustris*; some *P. palustris* individuals are, however, as vigorous as those of hybrid origin.
It is pointed out that no new strains can possibly be bred in time for use in the post-war afforestation scheme. Attention must therefore be given to finding the best seed sources of the chief *Pinus* species.
Recommendations are made for long term breeding aims. Progeny tests of *Pinus* spp., and intercrossing between pairs of clonal parents of different sexual origin obtained from superior progenies, are suggested, combined with large scale clonal propagation of desirable parents for the purposes of seed production. The production of inbred lines with a view to securing heterotic intraspecific hybrids, interspecific hybridization, nursery selection of the

chief *Pinus* spp., a study of methods of inducing flowering, polyploid induction and work on mutations are in addition recommended.
Brief reference is made to the improvement of the tan wattles, *Eucalyptus*, fodder species, and shade or shelter trees.

513. KIELLANDER, C. L. 634.975:575(48.5)
Om barrträdsförädling och barrträdsympning. **(Breeding and grafting of conifers).**
Svensk PappTidn. 1946 : **49** : 556–63.

KIELLANDER, C. L.
Breeding and grafting of conifers.
Anglo-Swedish Rev. 1947 : 63–66.

A broad and comprehensive account is given in the first article of the origin, development, principles and present trend of conifer breeding and grafting in Sweden, citing some of the results of work at the Brunsberg and Sundmo stations and the Berg and Dalfors substations. Forest surveys, improved seed production, progeny testing, and cold chamber selection in the production of hardy spruces, experimental induction of flowering, and the various techniques of grafting to obtain scions and stocks, are among the subjects treated.
There are numerous illustrations, especially relating to results obtained in grafting pine and spruce. The seasonal factor in grafting and labour requirements are also mentioned.
Some of the work recorded has already been reported in reviews in *Plant Breeding Abstracts* of annual reports on forest tree breeding in Sweden.
The second article is an English summary of the first.

514. LINDQUIST, B. 634.975:575.061.1:581.6
Virkeskvalitet och rotnetto-värde hos smalkronig och bredkronig tall. **(Timber quality and value "at stump" of pines with narrow and pines with broad crowns).**
Svenska SkogsvFören. Tidskr. 1939 : **37** : 1–119.

In pines of the narrow crowned and broad crowned types and equal in dimensions and early development, there are marked differences in the quality of the branches and the value at stump.
The two crown types are mentioned as being heritable but the point is not discussed.

515. DUFFIELD, J. W. 634.975:581.331.2(79.4)
Dates and places of pollen collection by the Institute of Forest Genetics.
For. Res. Note, Calif. For. Range Exp. Sta. 1947 : No. 54 : 1–5.

The earliest, latest and average dates of collection of pollen from 57 *Pinus* species, varieties and hybrids during a ten year breeding project are tabulated. Most of the data are for latitude 39° N., longitude 121° W., and altitude 2700 feet, but data for other stations in western North America are included.

516. 634.975:581.331.2:576.356
634.975:576.356:581.141
ANDERSSON, E. 634.975:581.14
Pollen and seed setting studies of an asyndetic spruce and some normal spruces; and a progeny test of spruces.
Svensk PappTidn. 1947 : **50** : 74–83, 113–17, 146–52, 177–79.

An account is given of the pollen characters of 20 spruce varieties. In one of these, the asyndetic spruce, the pollen was found to vary greatly in both size and shape. The 2·6% good pollen included 1·7% of very large grains, probably resulting from unreduced gametes. It was noticed that the male flowers of this variety were extra large. Three spruces with irregular mitosis owing to agglutination of the chromosomes, exhibited very low fertility. All the normal spruces were very fertile except No. 1 Lekvattnet with 84·3% good pollen. A significant heterogeneity in pollen size was noted among the varieties with normal meiosis. The frequency distribution of the pollen grain dimensions is recorded and discussed.
Measurement of the stomata of the asyndetic spruce showed that they vary significantly in size in different parts of the crown.

Details of seed setting in the asyndetic spruce and three normal spruces after self-fertilization, crossing and free flowering are recorded and discussed. They indicate very high gamete lethality in the asyndetic spruce, and it is estimated that about 83% of the zygotes died. In No. 121 Fredros pollinated with pollen from the asyndetic spruce the zygote lethality was even higher. In the normal spruces, the seed setting after selfing was decidedly inferior to that after crossing and free flowering. Different cross combinations gave different results in respect of the number of full and germinable seeds.
An account is given of the morphological characters and growth rates of various spruce progenies raised after free flowering. Significant differences in height, diameter and number of branches per whorl were already shown by three and four year old progenies.

517. THOMSON, R. B. 634.975:581.481:576.12
"Polyembryony" sexual and asexual embryo initiation and food supply.
Trans. Roy. Soc. Can. 1945 (1946) : **39** : Sect. **5** : **143–69.**

The ways in which polyembryony occurs in plants and in animals are compared. In both, a group of embryos of paternal type may develop each from a separate zygote or one or more zygotes may each produce several embryos by budding. Buchholz's suggestion that the budding form of ontogeny in the pine is the most primitive in conifers and the base of an extensive phylogenetic series of forms of budding ontogeny including simple forms is considered in relation to the theories of animal embryogeny to which it is opposed. In a discussion of the morphological basis for the interpretation of conifer embryology it is contended that Buchholz's conclusions are not based on adequate evidence. It is emphasized that the morphological expression of any hereditary feature cannot be used to determine the course of phylogeny until the extent of its variability under different conditions has been determined and taken into account.

518. SHARP, A. J. 634.975:581.9
***Pinus Strobus* south of the United States.**
J. Elisha Mitchell Sci. Soc. **1946** : **62** : **229–30.**

The northern white pine, *P. Strobus*, has generally been considered as indigenous only in the eastern United States and Canada. Recently Martínez (cf. *Plant Breeding Abstracts*, Vol. XVII, p. 108) has described a new variety *P. Strobus* var. *chiapensis*, occurring in Mexico. The author has also observed this variety growing naturally in Guatemala.

519. HAHN, G. G. 634.975–2.4–1.521.6
Berg's rust-resistant red cedar susceptible to *Phomopsis juniperovora* in greenhouse tests.
Phytopathology **1947** : **37** : **530–31.**

It is noted that the red cedar (*Juniperus virginiana* L.) clone reported by Berg (cf. *Plant Breeding Abstracts*, Vol. XI, Abst. 480) to be highly resistant to cedar apple rust (*Gymnosporangium Juniperi-virginianae* Schw.) is susceptible to juniper blight caused by *Phomopsis juniperovora* Hahn.

VEGETABLES 635

520. PERRONNE, P. 635(65)
Légumes de grande consommation. **(Vegetables important for food.)**
Bull. Gén. Affaires Écon. l'Algérie **1945** : No. **38** : Pp. **16.**

Brief descriptions are given about different varieties of carrot, turnip, cabbage, onion and leek, and instructions for producing seeds are included.

521. 635:575
Thirty-second Annual report of the Experimental and Research Station, Turner's Hill, Cheshunt, Herts 1946 : Pp. 76.

Lettuce
Cheshunt Early Giant remains the best lettuce for heated glasshouses during autumn and winter. Cheshunt Early Ball is recommended for cold houses, cold frames and cloches. It does not bolt. The progeny of a cross made in 1936 between Cheshunt Early Giant and a Green Frame strain are described. Two superior varieties, 5A and 5B, have been

selected from this progeny. Descriptions of these, Cheshunt Early Giant and Cheshunt Early Ball, all cabbage lettuce of the Butter Head type, are given.

Cucumber

The results of varietal trials are given. An old form of Telegraph gave the highest yield, followed by Butcher's Disease Resister and Rochford's Market.

Tomato

The results of manurial treatment experiments show that variety E.S.1 tolerates KCl more than Potentate does, and this variation in reaction is reflected slightly in crop yield. Leaf Mould Resister No. 1 has been improved by selection and has maintained a high resistance to *Cladosporium fulvum*. The results of yield tests of different varieties are reported. Four seedlings from Potentate were raised. One is being further studied under the name E.S.6 and seeds were taken from another for future use.

522. Zweede, A. K. 635:577.16
Verwerking van tuinbouwproducten en hun voedingswaarde. (**Processing of horticultural products and their nutritive value**).
Landbouwk. Tijdschr. Wageningen 1946 : **58** : 567–86.

In addition to methods of preserving and manufacture the chemical composition and vitamin content of various horticultural plants are examined.

523. Lamm, R. and Hylmö, B. 635.00.14(48.5)
635–1.521.5(48.5)
Kort redogörelse för klassificerande sort- och stamförsök med köksväxter vid Statens trädgårdsförsök. Översikt för år 1941. (**Short report on trials for the classification of varieties and strains of vegetables in the State horticultural experiments. Survey for 1941**).
Berätt. Alnarps Landtbr.- o. MejInst. 1942.
Medd. Stat. Trädgårdsförsök No. **15** : Pp. 18.

This report gives the results for 1941 from the continuous trials of varieties and strains in progress at the Alnarp Horticultural Research Station.

The regulations are stated governing participation in the trials, and also the criteria for "first-class" varieties or strains of self-pollinating and cross-pollinating crops. A list of such varieties and strains is given: most of them have also been tested under the system of State Control of Vegetable Seed, which makes it possible to guarantee to buyers genuine seed of any officially controlled first-class strain.

Among new first-class varieties and strains described are: the stringless dwarf French beans, Record O. E/41, a very high yielding bean of good quality and markedly resistant to *Colletotrichum Lindemuthianum*, and Arla W 5/41, the earliest bean of this group yet known in Sweden; Triumf O. 3/41, a very early dwarf, wax-pod type, resistant to *Colletotrichum*; the forcing lettuce Hammenhögs driv/41, O.J.O., derived from Tom Thumb but retaining its heart for a longer period without running to seed, and resistant to bacterial spot, but not to *Bremia Lactucae*; the greenhouse tomato Potentat/41, O.J.O., and the indoor variety Ueberreich/41, B.G., both high-yielding tomatoes; the early pea varieties, Dvärgsabel [Dwarf sword] 41, O.J.O. and Norrlands Express O.E./41, both sugar peas, Primör/41, O.J.O., a medium tall marrowfat, the earliest of this type known in Sweden; Helios/41, O J.O., also a marrowfat pea suitable to replace Lincoln which often suffers badly from *Fusarium*; the new early greenhouse cucumber Perseus W : s/41, W.W., very nearly equal to the productive Hunderup strains in yielding capacity and characterized by short light green fruits with a pronounced neck, and not very rough skinned.

Some first class strains of carrots, parsley, garden beet and spinach were also approved.

524. Lamm, R. and Hylmö, B. 635.00.14(48.5)
635–2.484–1.521.6(48.5)
Kort redogörelse för klassificerande sort- och stamförsök med köksväxter år 1942. (**Short report on trials for the classification of vegetables, 1942**).
Berätt. Alnarps Landtbr.-o. MejInst. 1942.
Medd. Stat. Trädgårdsförsök No. **16** : Pp. 20.

This report from the Alnarp Horticultural Research Station gives the results of continuous testing of varieties and strains.

Owners of promising varieties and strains are allowed to submit samples for these official trials in which a high standard of yield, earliness, quality, disease resistance and varietal purity are the criteria for "first class" varieties and strains.
A list of the varieties and strains adjudged first-class is given. Most of the first class strains are tested also under the State Control of Vegetable Seed, which ensures to purchasers genuine seed of any state-controlled first-class strain.
The first-class varieties of legumes and tomatoes include:—Hundrafören 11/42, O.J.O., a stringless dwarf bean selection from Lyonnais à Grain Clair; Bonner Beste/42, O.J.O., an outdoor tomato, about five days earlier than Danish Export, and higher yielding, though not so smooth skinned; Tidig Jätte '42, D.F. [Early Giant], a medium tall, very early, sugar pea, though about a week later than Norrland's Express O.E./41), with a high yield of pods of suitable size; Aurora/42, W.W., a tall, edible-podded marrow fat pea with round pods and rather thick walls. The last named was derived from Apollo x Norrlands and is the earliest of this group of peas.
Among the first-class strains are the following: Superb O.E./42, a strain of a new variety of green pickling cucumber for out-of-doors; it has small dark green high quality fruits and is related to Rheinische Trauben [Rheinland Grape] but is more productive and more resistant to *Cladosporium cucumerinum.*
Amager Vinter W : s 42, W.W. is a first-class strain of a new late white cabbage; it is medium tall and has a compact head.
Strains of onions, parsnips, parsley, leek and spinach are also described.

525. 635.00.14(48.9)
63.00.15(48.9)

Beretning fra Statens Planteavlsudvalg for finansaaret 1939–40. **(Report of the State Committee for Plant Cultivation for the financial year 1939–40).**
København 1940 : Pp. 103.

In addition to providing useful information about the official stations, institutes, committees, etc., connected with plant cultivation in Denmark, this report sets out the regulations (dated December, 1939) relating to trials of varieties and strains of vegetables at the state experiment stations in Denmark.
Two new stations began work during the year, one at Aarslev and one at Jyndevad.
The discussions on the programme of work put forward by the experiment stations included the following points of interest:—J. Hanson mentioned that the possibility of maize growing is being examined and four or five varieties are to be tested to see if the crop is worth growing. H. Bagge reported that water content was stated to vary greatly in maize varieties. H. Sørensen and S. Brunn discussed the proper Danish designation for *Allium Cepa.*

526. 635.00.14:575
633.426:575.12

Young, R. E.
Experimental work in plant breeding at the Waltham Field Station.
Mass. Com. Veg. Grower, Jan. 10, 1945 : 1–3.

Some of the breeding work in progress at the Waltham Field Station is described. It is chiefly concerned with the production of vegetables well adapted to the climate.
The yield of the best Asparagus selection in 1944 was almost double that obtained from commercial seed but the plants show considerable variation. Purification of the strain is being attempted by selecting for high yield.
In tomato variety trials, Red Cloud was outstanding for its smooth, early fruit of the Victor type. It cannot be grown on trellis. Only two of the many strains and hybrids grown during the year outyielded Trellis No. 22. The two require further testing.
Several years' work on the breeding of greenhouse cucumbers have led to the production of two strains and two hybrids now ready for trial. An average increase in yield of 16% over that of the parents has been given by hybrid cucumbers.
The most satisfactory rutabaga variety resulting from several years' breeding work is Bristol White. It has white flesh and a white shoulder. Waltham Yellow, another new

strain which has smaller tops than Bristol White, light yellow flesh and a purple shoulder is recommended for trial.
In order to produce a taller Summer Pascal celery with a larger number of heart stalks, crosses have been made with a yellow variety, Cornell 19. Seed has been obtained from a large number of selections of the hybrid material. Maintenance and improvement of the stock seed of Summer Pascal celery is also a part of the project.
In an attempt to develop a carrot with the good qualities of Hutchinson but a better colour, crosses were made between this variety and a long red carrot of Turkish origin. Some of the progeny were promising but are to be back-crossed with Hutchinson to remedy their slow growth rate. Some improvement in Hutchinson carrot has been effected by seed selection.
In variety trials of New York lettuce in 1944, Great Lakes and Imperial No. 456 produced satisfactory crops and are recommended for local use. Imperial No. 456, which was bred for use on muck land, tends to produce a small head when grown on upland. A promising new hybrid strain is mentioned.
Only five broccoli strains out of 55 strains and varieties grown in Autumn 1944 were at all outstanding.
Eighteen new strains of Butternut squash all showed considerable variation as regards shape, colour, texture and yield.
Samples of seed of any varieties developed at the Waltham Field Station are available for trial without charge.

527. Laumont, P. and Coste, A. 635.24(65)
Le topinambour. (**The Jerusalem artichoke**).
Bull. Direction Gén. Agric. de l'Algérie 1942 : No. 63 : Pp. 4.
Some information is given about different varieties of Jerusalem artichoke grown in Algeria.

528. 635.24:575.127.2:633.854.78:581.6(47)
Sugar-bearing hybrid from sunflower and ground pear.
Soviet News 1947 : No. 1780 : p. 2.
It is briefly reported that I. M. Marčenko, working at the Kharkov Institute of Genetics and Selection, has succeeded in growing a sugar-yielding hybrid derived from a cross between the sunflower and Jerusalem artichoke. The hybrid gives good yields of tubers with a high sugar content.

529. Fardy, A. and Hitier, H. 635.25:576.356:581.04
Étude de l'action comparée de la colchicine et de la nicotine sur les jeunes méristèmes d'*Allium Cepa*. (**A study of the comparative action of colchicine and nicotine on young meristems of *A. Cepa*).**
Mém. Serv. Exploit. Industr. Tabacs Allumettes 1945 : **1** : Sér. B : 121–27.
The effects of colchicine and nicotine on mitosis in the root tip of *A. Cepa* are compared. The necessary conditions for inducing polyploidy by means of colchicine are stated. Nicotine has a toxic effect on the cells at concentrations from 0·2% upwards. According to the concentration it slows down mitosis or inhibits it altogether by altering the structure of the nucleus.

530. 635.25:582
635.26:582
Domokos, J.
Adatok termesztett hagymáink taxonomiájához. (**Notes on the taxonomy of cultivated onions**).
Bull. Hung. Coll. Hort. Vinecult. **1944 : 10** : 146–51.
An account is given of the distribution and origin of *Allium fistulosum* and *A. Cepa*. Their different varieties are described including the new variety *A. fistulosum* L. var. *proliferum* Domk. E. E.

531. Currence, T. M. and 635.31–1.557:575.12
Virta, A. A. 635.31–1.531.12
Breeding an improved strain of Washington asparagus.
Minn. Hort. 1945 : **73** : 55–56.

A breeding project was started in 1932 with the object of establishing a method of seed production which would eliminate unproductive asparagus plants and ultimately provide a strain with a uniformly high yield. The progeny of different crosses varied widely as regards yield and the results show that in breeding for high yield, parent plants must be selected according to the results of progeny tests and not merely on the basis of their own yield.

The use of double crosses is suggested as a means of quickly producing seed on a large scale.

532. Hylmö, B. 635.34–2.111–1.521.6:581.192
Disackaridbildning hos vitkål vid kall väderlek. (**Disaccharide formation in white cabbage during cold weather**).
Berätt. Alnarps Landtbr.-o. MejInst. 1942.
Medd. Stat. Trädgårdsförsök No. **17** : Pp. 37.

The results of observations on white cabbage for six localities in Sweden are discussed at length, including aspects such as varietal difference in the amounts of certain chemical compounds present, cold resistance, and length of storage. It seems possible that the disaccharide content might serve as a criterion in selection for cold resistance and good storage properties.

There is an extensive bibliography.

533. Pound, G. S. 635.34–2.8–1.521.6(79.7)
Reactions of cabbage varieties to mosaic viruses.
J. Agric. Res. 1947 : **75** : 19–30.

Cabbage varieties were tested for their reaction to mosaic. Isolates of virus A or a strain of turnip virus 1, virus B or a strain of cauliflower virus 1, a mixture of A and B, and a mixture of B and the Californian black ring virus were used in various experiments. The varieties tested fell into three broad classes of reaction. The least susceptible group included Wisconsin All Seasons, Stein's Early Flat Dutch, All Head Select, Succession and Globe. The following varieties exhibited intermediate susceptibility: Golden Acre, Resistant Detroit, Copenhagen Market, Marion Market, Midseason Market, Glory of Enkhuizen, Early Round Dutch, Early Jersey Wakefield, Charleston Wakefield, All Head Early and Premium Late Flat Dutch. The most susceptible group comprised Wisconsin Hollander, Bugner, Penn State Ballhead, Ferry's Hollander, Wisconsin Ballhead and Improved Wisconsin Ballhead.

534. 635.41:575–181(48.5)
Cavallius jättespenat. (**Cavallius giant spinach**).
Försök och Forskning 1947 : **4** : p. 75.

This new spinach produced by H. Hyltén, Cavallius, is claimed to be the fastest growing and largest spinach known. It is specially suited for harvesting in winter and is meant for growing under glass. But it is not one of the frost-hardiest varieties. Its yield is three to five times more than that of ordinary varieties.

535. Lewis, M. T. 635.52:581.6:575(74.8)
Lettuce breeding at State College.
Pa. Veg. Gr. News 1944 : **14** : No. 3 : 22–23.

The performance of different lettuce varieties in the season 1943–1944 is reported. A superior strain of Great Lakes has been developed by straight line selection. It is more uniform than the commercial strains and has exceptionally large, solid heads. Great Lakes has also been used as one parent in a number of crosses of which the fourth and fifth generations show great uniformity of heading, freedom from tipburn and unusual solidity. Another Pennberg variety to be released for trial is a cross of Imperial 44 and Cosberg, producing very uniform, early, hard heads.

536. SANSOM, C. H. 635.561:575.42
Cultivation of watercress.
Bull. Minist. Agric., Lond. 1947 : No. 136 : Pp. 25.
The selection and propagation of plants showing an improvement upon the ordinary stock is recommended to growers.

537. WORK, P. 635.6:581.6(73)
Vegetable varieties: new and improved.
Fm Res. N.Y. St. Sta. 1946 : **12** : No. 1 : p. 6.
Some recently introduced varieties are described including the following: Longreen (Rogers), a longer version of the green snap bean variety, Tendergreen; Badger and Minnoval, two early, vigorous, productive egg plants for Northern U.S.A., with well coloured, egg-shaped fruits of a good size and held well off the ground; Butternut squash, a cushaw (*Cucurbita moschata*), 8 to 10 inches long with a bulbous body and very thick neck, buff in colour, very meaty and of high table quality; a strain of Buttercup squash which is small, flattened, very meaty, free of fibre, dry, and sweet and nutty in flavour.

538. NAITHANI, S. P. and PURUSHOTTAM, DAS. 635.61/3:576.312.35
Somatic chromosome numbers in some cultivated cucurbits.
Curr. Sci. 1947 : **16** : 188–89.
The following chromosome numbers are reported: *Luffa aegyptiaca* Mill., the Ninawa local var., $2n = 26$; *L. acutangula* Roxb., the Taroi var., $2n = 26$; *Cucumis Melo* L., Sarda, $2n = 24$; *Cucumis Melo* L. var. *utilissima* Roxb., the Kakri var., $2n = 24$; *Cucumis Melo* L. var. *momordica* Roxb., the Phunt var., $2n = 24$; *Cucumis sativus L.*, the Khira var., $2n = 14$ and *Citrullus vulgaris* Schrad. var. *fistulosus*, the Tinda var., $2n = 22$.

539. DOLAN, D. 635.61–2.483–1.521.6(74.7)
A new anthracnose on melons.
Phytopathology 1947 : **37** : 583–96.
In the course of musk-melon and water-melon breeding work in New York State, a second form of anthracnose has been observed, distinct from the usual anthracnose caused by *Colletotrichum lagenarium* Ells. et Hals. The new anthracnose disease is produced by a species of *Marssonina*, designated by the author as *M. Melonis* nov. sp. The investigations on both kinds of anthracnose included artificial inoculation tests of the resistance of musk-melon and water-melon varieties and some hybrid material. The Conomon musk-melon and its relatives, White melon and Freeman cucumber, showed a relatively high degree of resistance to *Marssonina*, which was found to be a dominant character in F_1 hybrid progenies. Mardela, Asgrow's Honeydew, Accession 106, 140666 and 123493, were also significantly more resistant to *Marssonina* than Bender and most of the other commercial musk-melons tested. The Honey Cream water-melon was relatively more resistant to *Marssonina* than other water-melon varieties. In the tests of resistance to *Colletotrichum* the Conomon musk-melon, Casaba musk-melon and McCrea water-melon showed more resistance than the other melons tested.

540. EPPS, J. M. 635.615–2.484–1.521.6:575(78.8+76.2)
A new wilt-resistant water-melon.
Phytopathology 1947 : **37** : p. 433. (Abst.).
As a result of the co-operative water-melon breeding work conducted by the Tennessee and Mississippi Experiment Stations, a new wilt resistant variety named Miles has been developed from a cross between Dixie Queen and Klondike. Growers' trials have indicated that the water-melon gives satisfactory results as regards fruit size, shape, colour and quality, and wilt resistance. It usually sets many fruits.

541. WHITAKER, T. W. 635.62:576.16
American origin of the cultivated cucurbits. I. Evidence from the herbals. II. Survey of old and recent botanical evidence.
Ann. Mo. Bot. Gdn 1947 : **34** : 101–11.
Evidence is given in support of the view that the four species, *Cucurbita Pepo, C. moschata, C. maxima* and *C. ficifolia* have an American origin.

542. PALJČEVSKIĬ, V. I. 635.62:581.47:575.061.1:519.241.1
(Correlation between form of cotyledon and fruit form in cucurbits).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : Nos 4–5 : 71–72.

The cotyledons were examined in 30 varieties of *Cucurbita* belonging to five different species, and the fruits were measured when ripe. There was a correlation between form of fruit and cotyledon in 26 of the varieties, all forms in which the ratio of cotyledon length to breadth was less than 1·5 having round fruits. The exceptions included the variety Pattison of *C. Pepo*, varieties 655 and 735 of the Birjučiĭ Kut breeding station, and the Chilean bush gourd.

543. WALTON, R. R. 635.62–2.951.1
Effects of chlorinated hydrocarbons and sabadilla on insects and plants.
J. Econ. Ent. 1947 : **40** : 389–95.

The squash varieties, White bush, Yellow Crook-neck and Acorn were seriously retarded in development when treated at an early age with DDT and benzene hexachloride but recovered markedly during the rest of the season.

544. PERRONNE, P. 635.64(65)
Culture de la tomate en Algérie. **(The cultivation of the tomato in Algeria).**
Bull. Direction Agric. l'Algérie 1945 : No. 41 : Pp. 18.

Some information about different tomato varieties grown in Algeria is given.

545. PORTER, D. R. 635.64:575(73)
The Garden State tomato variety (formerly hybrid No. 37).
Pa. Ten-Ton Tomato Club Rep. 1943 : 57–59.

In four years' tests, Garden State has consistently outyielded Rutgers and Marglobe in New Jersey and Pennsylvania; it is remarkable, also, for its earliness. It originated from a cross involving Pritchard, Marvel and Pink Topper. The average yields of Garden State and Rutgers, based on 65 tests in ten different states from 1940 to 1943, were 10 and 8·5 tons per acre respectively. Further details of the results of these tests are given. Garden State is early in the sense that its production peak is reached comparatively early. Numerous tests showed that it matured 6% more of its total crop before 25 August than did Rutgers. The fact that this early maturity enables most of the crop to escape the effects of unfavourable weather in late August and early September may be one reason for the high yield of Garden State. In Pennsylvania, especially, it significantly outyielded Rutgers. For three years it has produced bigger fruits than the latter variety with similar flavour and vitamin C content. Garden State is slightly superior to Rutgers in pulp percentage and resistance to *Fusarium* wilt but slightly inferior as regards colour, trimming waste, ease of picking and resistance to yellow top, fruit cracking, blight, leaf spot and blossom end rot. Work is in progress to correct its defects.

546. TOTMAKOV, G. V. 635.64:575.125(47)
(Heterosis in tomatoes).
Jarovizacija i Selekcija (Vernalization and Plant Breeding) 1937 : 57–93.

According to the school of Lysenko, Mičurin, and Prezent, heterosis is a particular example of dominance, and is the result of a given environment favouring in a heterozygote one of a pair of allelomorphic characters, causing it to be dominant over the other. Such a heterozygote of the F_1 generation is held to possess greater powers of development than are present in the genetical composition of either parent, and to be more adaptable.
In the present article it is concluded that the F_1 hybrid progeny of different varieties of tomato which were crossed with one another were usually more vigorous and higher yielding than the parents. I. Z.

547. HOFFMAN, I. C. 635.64:575.125(77.1)
First generation tomato hybrids for greenhouse use.
32nd Proc. Ohio Veg. Potato Gr. Ass. 1947 : 148–53.

Experiments were carried out on F_1 hybrids of pink-fruited tomato varieties suitable for greenhouse use. The following varieties were crossed among themselves: Globe strain A, Globelle, Marhio, Eberle 304, Cooper's Special, Oxheart, Ponderosa, Gulf State Market, Holmes' Improved Globe, Livingston Globe, and Rosy Morn. The F_1 hybrids were compared with Globe strain A, Globelle and Marhio. A number of F_1 hybrids yielded more and better fruit than Globe strain A, the leading greenhouse variety. Several hybrids had to be discarded on account of blotchy ripening, while others were discarded on account of poor fruit size or other defects. Promising hybrids are to be tested again.

The possible effect of seed size upon yield was investigated. Within the varieties studied the yields from large and small seed were fairly close. The plants from the large hybrid seed produced one to six pounds more fruit per plant than those from small hybrid seed; the number and size of the fruits were greater in all cases of the plants from the large hybrid seed. This result suggests that the grading of F_1 hybrid seed for size may be of commercial importance.

The hybrids and three comparative varieties were also subjected to chemical analysis. Several hybrids showed a higher content of dry matter and certain mineral elements than the other hybrids, suggesting that by further breeding work it may eventually be possible to combine higher yields and nutritive value in F_1 hybrids.

548. *GLUŠČENKO, I. E. 635.64:575.257
(Experimental data on hybridizing tomatoes by grafting).
Agrobiologija (Agrobiology) 1946 : No. 3 : 78–105.

Copious quotations are given from the writings of Darwin, Timirjazev, Mičurin and Lysenko in support of the existence of vegetative hybrids. Experiments with graft hybrids were begun in 1940, including the following:—

The wild Mexican tomato 353 with red fruits was grafted on to the yellow fruited variety Zolotaja Koroleva [Golden Queen]. No alterations were observed in the Mexican tomato, but Golden Queen produced nine fruits, of which four were modified in colour from slightly reddish to a form with bright red stripes or red star-shaped patches. The control had pure yellow fruits. In the first generation from the seeds of the modified fruits, some plants bearing both red and yellow fruits were obtained.

A currant tomato with small bilocular fruits was grafted on to Golden Queen, which has four locules. The currant tomato was also used as a stock for the variety Planovyi which has multilocular fruits. In each case, the currant tomato produced fruits with increased dimensions and three locules, a type never observed on the control.

The red-fruited dwarf variety Planovyi was grafted on to Želtyi Gruševidnyi [Yellow Pear] tomato. Five plum-shaped fruits were formed on the latter variety, one of them trilocular.

The red-fruited variety Humbert with bilocular smooth fruits was grafted on to Ficarazzi, which has red multilocular ribbed fruits. The Ficarazzi stock produced one smooth trilocular fruit, two round flattened smooth fruits with four locules, and a certain number of typical fruits. The controls were normal.

The red-fruited variety Japanese Giant, with compound fruit clusters, was grafted on to the yellow-fruited variety Goljden [Golden] with simple clusters. A number of compound clusters were formed on the Golden stock. All the controls were normal.

In many of these experiments modifications of fruit form were not transmitted to the seed progenies, whereas modifications of characters such as colour and number of locules were frequently transmitted.

The seeds of four fruits of Golden Queen, all golden yellow and containing relatively few seeds, on which Ficarazzi had been grafted, were sown in 1941. Of these, one bore golden yellow fruits, four bore red fruits, one raspberry coloured fruits and one yellowish red fruit. The F_2 generation segregated in a similar way to a sexual hybrid, except that the recessive forms also segregated. The F_2 progeny from each fruit type contained a preponderance of

* An extended summary of this paper is on file at the Bureau.

forms resembling the fruit from which it had arisen. The third and fourth generations contained a large number of plants of mixed type, bearing fruits of several types on the same plant and also a certain number of mottled fruits. No modifications were seen in any of the control progenies grown from untreated plants. The progenies from the grafted plants showed variation in a number of characters besides colour. Among these were fruit size and yield.

In grafts of Humbert on Golden Queen, two fruits on the latter variety were mottled red and yellow and three were pure yellow. In the F_1 generation none of the plants had any sign of red in the fruits, but all bore a certain number of bilocular fruits of the Humbert type, in addition to normal fruits of the Golden Queen type. Many of the fruits had a pointed protuberance or beak at the end. An F_2 generation was raised from pointed and round fruits growing on the same plant. In this and the F_3 and F_4 generations, there was a greater number of pointed fruits, but plants bearing only pointed or only round fruits were never obtained.

Golden Queen was grafted also on to the red-fruited variety Sparks, and two fruits with red streaks over their entire surface were produced. The seed progeny of these fruits was examined and compared with the progeny of an ordinary cross between the two varieties; the F_1 of the cross showed complete dominance of the red colour, whereas the grafts bore only 30·8% of reddish-yellow fruits. The smooth round fruit form was dominant in the F_1 of the cross, but in the grafts about half the fruits deviated towards the Sparks type. The F_2 of the cross segregated into pure red and pure yellow fruited types, and no variation within the plant was ever observed; on the other hand the F_2 plants from the grafted plants again bore pure yellow fruits and yellow and red fruits on the same plant, and also multilocular ribbed fruits of the Sparks types together with round fruits with few locules of the Golden Queen type.

The wild Mexican tomato 353 was grafted on to Golden, a variety with small yellow fruits and two, or rarely three, locules. Some of the fruits on the Golden stock had bright red patches, and the seeds from two such fruits were sown. Fruits with bright red patches again appeared on some plants among the progeny, though some pure yellow fruits appeared on the same plant; other plants bore only yellow fruits. Fourteen plants of the F_2 generation were grown and some of these bore both round and slightly elongated fruits; only one plant showed variations in colour, the rest bore only yellow fruits. In the F_3 generation variations occurred for both colour and form of fruit; thus plants bearing all red, all yellow or all orange fruits occurred, and others bearing yellow fruits with red spots. There were flattened round fruits, ribbed fruits, plum-shaped fruits and one giant plant with small yellow seedless fruits. There were a great number of fruits with three locules. The variation in the F_4 was still greater.

The dwarf variety Želtyĭ Persik [Yellow Peach] was grafted on to Mexican 353; fifteen fruits were formed by the latter, of which four proved to be trilocular and one quadrilocular. The seed generation showed great variation, some fruits were small, others large, but the smaller types predominated. In the later generation there was a progressive increase in fruit size, some fruits weighing up to 159 grm. in the F_3; the majority of the fruits contained 4–5 locules, but many fruits with up to 9 appeared. The dwarf variety Planovyĭ with large, red, multilocular fruits, grafted on Yellow Pear, with bilocular yellow fruits, produced four fruits with a slight beak, the remaining four being perfectly round. The seed of the two types was sown separately; both gave fruits of both types, with the round type predominating; no amount of selection succeeded in establishing a pure beaked type.

A biochemical analysis was made of four of the vegetative hybrids, the results of which showed that as regards total sugars the hybrids approached the ungrafted control, but they exceeded it in the amount of reducing sugars. In ascorbic acid content, the grafted plants exceeded the controls, and so did the fruits of the first seed generation from the graft of Ficarazzi on Golden Queen. The influence of the scion on the seed progeny of the stock was detected also in regard to total acidity.

In the graft of Mexican 353 on Golden, the stock bore fruits containing sucrose, although the control plant of Golden contained none. The vitamin content in this graft remained unchanged, but the acidity equalled that of the scion variety. The seed progeny showed a notable increase in the percentage of carotenoids as compared with the original Golden.

In all the grafts the peroxidase content was modified in the stock, in the direction of the values characteristic for the scion.
In the second seed generation of the graft Ficarazzi on Golden Queen, the fruits with red patches contained less sugars, both total and reducing, than the yellow fruits; they also contained slightly less acid but somewhat more ascorbic acid, and considerably more carotenoids.
In all the experiments it was found that the characters of the stock were more influenced by the scion than those of the scion by the stock.

549. *Bazavluk, V. Ju. 635.64:575.257:581.175.11
(Investigation of the fruit colour of vegetative hybrids).
Agrobiologija (Agrobiology) 1946 : No. 3 : 106–14.

A study was made of the fruits of the fourth seed generation from three tomato grafts, Ficarazzi on Zolotaja Koroleva [Golden Queen], Mexican 353 on Goljden [Golden] and Humbert on Golden Queen. The fruits of Golden Queen contained a yellow pigment and yellow plastids in the cells of the skin, and there was a carotenoid pigment, probably xanthophyll, in the cells of the flesh. Ficarazzi had the same yellow pigment in the skin, together with pink plastids, and the cells of the flesh contained pink crystals of lycopene.
A lemon yellow fruit of the F_4 of the graft had a colourless skin with colourless inclusions, and yellow chromoplasts in the cells of the flesh. A pink fruit of the same generation had a colourless skin with yellow chromoplasts, while the cells of the flesh contained three kinds of cells: (*a*) those with pure yellow, round plastids, as in Golden Queen, (*b*) those with light red crystals of lycopene, as in Ficarazzi, and (*c*) those containing both.
Two fruits from another plant of the same generation were examined; one was orange red with yellow patches, and the other yellow with a red patch and red stripe on one side. In both fruits the skin was colourless.
The orange-red fruit contained cells with yellow chromoplasts, cells with red plastids and others with mixed plastids. The mottled fruits had a similar distribution of cells in the red sections, whilst the yellow sections contained only yellow plastids. The condition in a second vegetative hybrid of Mexican 353 on Golden, was similar to that in the first. A third hybrid showed no colour changes, but the skin was coarser than that of Golden Queen, and microscopic examination showed that the cell walls were about twice as thick.
In the F_2 generation of a cross of Golden Queen x Sparks the fruits were all either pure red or pure yellow, both types corresponding histologically to the pure parental types. No forms with mixed pigmentation appeared.
The results of these experiments are regarded as supporting Lysenko's affirmation that there is no difference between graft hybrids and sexual hybrids. The only difference observed is the somatic segregation in the graft hybrids.

550. Ežov, V. A. and Ošev, A. 635.64:575.257:632.111–1.521.6
(A tomato variety for unirrigated land).
Agrobiologija (Agrobiology) 1946 : No. 3 : 149–50.

Seedlings of the tomato variety, Bison, were grafted on *Solanum nigrum*, and the seedlings from the seed produced by the scion were likewise grafted on *S. nigrum*. The seeds from the third generation of graft hybrids were sown directly in the field, without any preliminary transplanting. The resulting plants were found to differ morphologically but little from Bison, but were resistant to drought, spring and autumn frosts, and tip-rot. This new variety was called Bogarnyĭ 71. It was vegetatively hybridized with a Bulgarian pepper; the fruit of the progeny somewhat resembled that of the pepper and kept good for a long time. I. Z.

551. Ivančenko, P. L. 635.64:575.257:633.491:581.192
(Modifying the economically useful characters of vegetable crops by means of grafting).
Agrobiologija (Agrobiology) 1946 : No. 3 : 143–45.

Potato and tomato varieties were grafted on stocks of different potato varieties. Earliana

* An extended summary of this paper is on file at the Bureau.

and Mikado tomatoes, for example, were grafted on Early Rose and Stahanov 3593 potato varieties respectively; and Humbert, San Morgano, Golden Queen, Earliana, Early Rose, and Mikado were used both as scion and stock when grafted on one another.
The general conclusion reached was that tomato plants grown from seed produced by the scions on potato stocks, and potato tubers formed on stocks on which potato and tomato scions had been grafted, were improved by grafting, the content of starch, sugar, and dry matter having been increased in many of the progeny described. Grafting also modified the shape and colour of the fruit, and the shape of leaves. I. Z.

552. Bohn, G. W. 635.64:576.356.5:581.04
Colchicine treatments for use with tomatoes.
J. Hered. 1947 : **38** : 157–60.

The results of experiments on the effects of treating *Lycopersicon peruvianum* var. *dentatum* and the Danmark and Waltham Forcing varieties of *L. esculentum* with colchicine are reported. Four lots of seed were treated with 0·4% colchicine solution for 48, 72, 96 and 120 hours, respectively. Data were recorded on the seedling emergence, seedling vigour and the numbers of slow-growing plants with thick swollen cotyledons, observed in the seed lots subjected to these four treatments and to the control treatment of tap water. The varietal factor caused the only significant variation in seedling emergence. In the case of seedling vigour, however, significant variation was produced by the factors of both variety and treatment. Soaking seeds for 48 hours in the 0·4% colchicine solution had no significant effect upon seedling vigour, but the longer treatments produced a progressively greater detrimental effect upon vigour. For the 72, 96 and 120 hour treatments, both variety and treatment produced significant variation in the number of plants showing swollen cotyledons; the longer treatments yielded progressively larger numbers of affected seedlings. Although the affected seedlings included some plants which grew slowly or failed to shoot, most of them gave rise to total tetraploids which grew vigorously. The most satisfactory treatments for the production of tetraploids were the 120 hour treatment for the *L. esculentum* varieties, and the 96 or 120 hour treatments for *L. peruvianum*. The 120 hour treatment with 0·4% colchicine solution has also been used to secure tetraploids of *L. pimpinellifolium* and *L. hirsutum*, amphidiploids of the hybrids of these two species with *L. esculentum*, and sesquitetraploids from sesquidiploid hybrids derived from crosses between tetraploid *L. esculentum* and diploid *L. peruvianum*.

553. 635.64:581.466:575.11
Rick, C. M. 635.64:581.49:575.11
Partial suppression of hair development indirectly affecting fruitfulness and the proportion of cross-pollination in a tomato mutant.
Amer. Nat. 1947 : **81** : 185–202.

A recessive gene *dl* is reported which brings about modification and a reduction in the numbers of the hairs on the various parts of tomato plants (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1345). In particular, the hairs that normally bind the anthers together are absent, and the latter consequently diverge. The seed set of flowers bearing divergent anthers is reduced under natural conditions.

554. Alexander, L. J. 635.64–2.484:576.16:631.521.6:575(77.1)
Progress on the development of *Fusarium* wilt resistant tomato.
32nd Proc. Ohio Veg. Potato Gr. Ass. 1947 : 137–40.

Work has been carried out at the Ohio Agricultural Experiment Station to develop a *Fusarium* wilt resistant tomato variety of the Globe greenhouse type (cf. *Plant Breeding Abstracts*, Vol. XVII, Abst. 1347). Wilt resistant breeding lines were obtained from the Missouri Experiment Station; two of these selections, M–8–2 and M–21–2, were chosen for further crossing. The pedigree of M–8–2 is given as follows: Earliana x *Lycopersicon pimpinellifolium* x Break O'Day x Break O'Day x Ponderosa, selfed in the field, further crossed with Greater Baltimore, and twice selfed in the field. The pedigree of M–21–2 is given as follows: Earliana x *L. pimpinellifolium* x Break O'Day x Bonny Best x Ponderosa, selfed in the field, hand-selfed, and finally twice selfed in the field. Lines M–8–2 and M–21–2 were then crossed and back-crossed with Globe or selections derived from Globe; limited

trials of selections 1, 3 and 5 obtained from this material are reported. The three selections gave higher spring and autumn yields than Globe strain A in 1946, and equalled Globe strain A in earliness or were possibly somewhat earlier. Seed of the three lines has been distributed to growers in Ohio for further testing.
Selections 1 and 3 appear to be immune to the widely distributed race 1 of *F. oxysporum* f. *Lycopersici*; selection 5 has been re-selected as it was not breeding true for resistance. Four sub-selections of selection 5 appear to be pure for resistance to race 1. None of the sub-selections show any marked resistance to race 2, but this race has only been found in one greenhouse in the Cleveland area of Ohio.

555. HUNGERFORD, C. W. 635.65–2.8–1.521.6:575.12(79.6)
Hybrid mosaic hits hybrid bean.
Idaho Fmr 1944 : **62** : p. 615.

Breeding work for resistance to mosaic and curly top in field beans is described. Hybrids between great Northern and Red Mexican proved resistant to both diseases. These hybrids are Red Mexican U.I.3, Red Mexican U.I.34, and Great Northern U.I.15. A new strain of mosaic to which the last of these is susceptible has now appeared but Great Northern U.I.123, U.I.50 and U.I.81 are immune to it.

556. ŠENDERECKIĬ, E. I. 635.652 (47)
(Extending the cultivation of *Phaseolus* towards the North).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : Nos 7–8 : 70–71.

Trials have been made with 70 varieties of *Phaseolus* in 35 representative areas of the Soviet Union. In 1945 a yield of 40 c. per ha. and over was obtained from five different varieties.

557. ALLARD, H. A. 635.652:581.143.26.035.1:576.16
The ecology of the wild kidney bean *Phaseolus polystachios* (L.) BSP.
J. Wash. Acad. Sci. 1947 : **37** : 306–09.

Ecological notes are presented on *Ph. polystachios*. This species is adapted to long days. It is mentioned on the authority of V. H. Jones that a large-seeded race of this species has been discovered in the Ozark region of Arkansas and Missouri, where apparently it was used as a food by the early aborigines.

558. ISAAC, W. E. and WINCH, N. H. 635.652:581.192
The guaiacol-hydrogen peroxide and benzidine-hydrogen peroxide colour reactions of the bean (*Phaseolus vulgaris* L.) pod.
J. Pomol. 1947 : **23** : 23–37.

The results of blanching experiments relating to the destruction of the relatively thermostable guaiacol-hydrogen peroxide reaction of the pods of different bean varieties are reported.

559. 635.652:581.6
635.653:581.6
HASTINGS, W. R. 635.67:581.6
Two new lima bean varieties are 1945 All-America selections.
Contact 1944 : **10** : No. 4 : 2, 7.

The Lima bean varieties Fordhook 242 and Early Market, the snap beans, Florida Belle and Improved Commodore, and the sweet corn hybrid, Goldengrain are described.

560. 635.652–2.3–1.521.6:575.42
LAVALLÉE, E. 635.652–2.483–1.521.6:575.42
Influence de la sélection sur la brûlure bactérienne et l'entrachnose des haricots. **(Influence of selection on bacterial scorch and anthracnose of kidney beans).**
Ann. Ass. Canad. Fr. Advanc. Sci. Montréal, 1942 : **8** : 115–16.

Two years' selection of healthy plants as seed bearers has led to a decrease in both the percentage of plants susceptible to bacterial scorch and anthracnose and the intensity of the diseases.

561. HUBBELING, H. 635.652–2.4–1.521.6(49.2)
Vatbaarheid van stamslaboonenrassen voor ziekten, welke met het zaaizaad overgaan. (**Susceptibility to seedborne diseases shown by varieties of dwarf French salad beans**).
Meded. Inst. Vered. Tuinbouw. Wageningen 1946 : No. 1 : Pp. 9.

Seedborne diseases are numerous; it is important to take into account the susceptibility to the most frequent ones, before attempting to cross varieties. This publication gives the results of several years of study in Holland with regard to the susceptibility of a number of varieties of dwarf French beans to common mosaic (*Phaseolus*-virus 1), *Pseudomonas medicaginis* var. *phaseolicola* Burkh., anthracnose [*Colletotrichum Lindemuthianum* (Sacc. et Magn.) Bri. et Cav.] and *Ascochyta* spot disease (*A. Boltshauseri* Sacc. and *A. Phaseolorum* Sacc.). It is intended to continue the research into this problem, but even at this stage a review of the results achieved, which are set out in a table, is of value.

The varieties have been classified according to their susceptibility. The following factors have been taken into account: (*a*) kind of disease (only virus, bacteria and fungi considered). (*b*) the bean variety (besides the resistance, also other qualities such as earliness, leafiness and height of the stalk considered), and (*c*) condition (environment, etc.).

There are a few varieties in U.S.A. which are not susceptible to common mosaic. In 1940 some new varieties were released in U.S.A. They have very long shoots and develop too late for the Dutch climate. Attempts are being made to secure their resistance by crossing them with Dutch varieties. Up to now all Dutch varieties have been found to be susceptible. It is pointed out that symptoms of common mosaic remain sometimes unnoticed, when the beans are grown at fairly high or fairly low temperatures, as well as when cultivated in weak light. The article gives detailed advice for the cultivation of several varieties, particularly as to temperatures, atmospheric humidity, and a good description of disease symptoms. E. M. F.

562. TAPLEY, W. T. 635.653.00.14
Bush lima beans show promise.
Fm Res. N.Y. St. Cornell Sta. 1946 : **12** : No. 2 : 13, 19.

Four new bush Lima bean varieties were grown and compared with seven standard varieties. The yields of pods and beans and of shelled beans are tabulated. Early Market is an improved type of Burpee Bush with large, flat seeds, ready for harvest about three days earlier. Fordhook 242 is a potato Lima type similar to regular Fordhook, maturing about the same time. It outyielded the latter by nearly 800 pounds. U.S.D.A. 243 and 343 are similar in type and season to Henderson. Both outyielded Can Green, Clark's Bush and Thorogreen in their first year trial at Geneva. They have rather small, compact plants with most of the blossoms and pods well covered by the foliage.

563. WESTER, R. E. and MAGRUDER, R. 635.653.00.14(73+71)
Results of 1946 Lima bean trials.
Canner 1947 : **105** : No. 4 : 24, 29.

The results of the 1946 Lima bean trials conducted co-operatively in the United States and Canada are summarized (cf. Abst. 564).

564. WESTER, R. E. and MAGRUDER, R. 635.653.00.14(73+71)
Peerless leads Lima trials.
Sth. Seedsman 1947 : **10** : No. 9 : 22, 27, 30.

A summary is given of the results of the Lima bean trials conducted by the United States Department of Agriculture in co-operation with various agricultural experiment stations in the United States and Canada. The following varieties were included in the nursery trials: Henderson Bush, Clark's Bush, Peerless (U.S. 243), U.S. 343, U.S. 403A, Early Market, Fordhook 242, Burpee Improved Bush, Fordhook and Concentrated (Asgrow) Fordhook. Sufficient seed of some of these varieties and also the Maryland strains 5622 and 5643 was available for planting plots of sufficient size for commercial threshing trials in seven states. In addition to data on yields, information is given on maturity, and canning and freezing

quality. The Peerless Lima bean gave the highest average yield of fresh marketable pods per acre at 31 out of 33 locations; at the remaining two locations yield was recorded as weight of shelled beans.

565. MORSE, W. J. 635.655

The versatile soyabean.

Econ. Bot. 1947 : **1** : 137–47.

This article presents an interesting account of the soya bean, referring to its botanical characteristics, history, present-day production and improved varieties, diseases, its utilization as food, and use for oil production and oil meal.

566. KERLE, W. D. 635.655(94.4)

Soybeans.

Agric. Gaz. N.S.W. 1947 : **58** : 227–31.

Experimental work on the soya bean has been carried out in New South Wales during the last 30 years by the Department of Agriculture. A large number of varieties have been introduced from the East, United States of America and other countries. The Northern Tableland is the district best suited for grain production, but the yields have not been sufficient to recommend the soya bean as a commercial crop. The Department of Agriculture is carrying out breeding and selection work and further trials of introduced varieties, with the hope of improving the yield. Notes are given on the following varieties which are at present available in New South Wales: Potchefstroom 169, Easy Cook, Haberlandt, Ototan, Lincoln, Dunfield and Richland.

567. 635.655:575(49.2)
635.655–2.3–1.521.6

KOCH, L.

Proeven met sojaboonen in Nederland. (**Experiments with soya beans in Holland**).

Landbouwk. Tijdschr. Wageningen **1946** : **58** : 269–72.

An account is given of the work done in Holland on the introduction and selection of soya beans from 1934 to 1940 during which 2064 varieties were tested. Many varieties were rejected and virus diseases imported with the seed had to be eliminated from the plots.

Only simple mutations of little value were observed and colchicine treatment to induce mutation proved a failure.

Given suitable conditions natural cross-pollination is possible and in 1936, one and in 1943, 21 natural hybrids were found. In 1935, attempts to obtain hybrids by the excess pollination method failed. In 1936 and subsequent years the attempts were repeated with plants raised, and emasculated and pollinated in pots. From 1937 to 1944, 1946 crosses were tried and eight hybrids were obtained. A practised hand can do three cross-pollinations in an hour.

Under very favourable conditions, J. J. Post obtained six hybrids from 64 crosses made at Wageningen in 1941.

Natural and artificial crossing has been successful in producing in the hybrid populations many new forms showing great variation in plant size and form, growth period, size and colour of seed, resistance to bacterial disease, etc.

Many varieties appear to be susceptible to *Bacterium glycineum* in wet years and hybrid selections from Weka x Kurakake and Kurakake x Batorawka had to be rejected in 1942. The remaining selections were severely infected in 1945 with serious effects upon yield. Some populations, however, obtained in 1941 and 1942 by natural crossing, were attacked only slightly or not at all. The Dutch climate demands immune or highly resistant varieties.

Another important factor in breeding is the capacity to form pods. Some varieties, under unfavourable conditions, fail in this respect entirely, others may form pods only on the lower part of the stem or at the base and at the top of the stem, but not in the middle.

In general, the new populations are satisfactory as regards cooking time, flavour and colour, all features in which considerable variation has been observed.

The possibilities of the soya bean as an economic crop for Holland are also examined in the light of the available information to date.

While awaiting the testing of the latest selections, hybridization—natural and even artificial—should be continued: the procedure to be followed and the technique in the plots are recommended with notes on the best way to utilize the differences in flower colour in identifying hybrid plants. Suggestions for the choice of parents are also made and the cross Kurakake x Batorawka is cited to show that two relatively late ripening varieties may give progeny ripening earlier than either parent.
In addition to hybridization, foreign varieties should be imported.

568. TING, T. L. 635.655:575.11
(Genetic studies on wild and cultivated soya beans).
J. Agric. Ass. China 1945 : Suppl. No. 50 : 22–24. (Abst. 25th Annu. Mtg).

The following results were obtained in seven years' genetical investigations.
No sterility was found in the F_1 and F_2 generations of crosses between the wild soya bean and cultivated varieties. The cultivated varieties are therefore closely related to the wild soya bean, differing probably only in gene mutations.
In the F_1 generation of these crosses hybrid vigour was expressed in the number of branches and number of seeds.
The results of investigations on the inheritance of seedling colour, flower colour, hair colour, fruiting habit, pod colour, seed-coat colour, hilum colour, cracked coat and other characters were in agreement with those obtained by previous workers.
A new character, that of the hair tip, was discovered by microscopic examination. Pointed hair was found to be dominant over blunt, depending upon a single gene, designated *Bl*.
The new character of the water-absorbing capacity of the seed-coat is also reported. The less absorptive seed-coat is dominant over the more absorptive, and depends upon a single gene, designated *H*.
Height of plant, seed size and seed form showed quantitative inheritance.
The character of yellow pod was found to be linked with determinate fruiting habit with a cross-over value of 34·26%. This linkage is reported to be independent of the four linkage groups previously known, and is tentatively regarded as belonging to a fifth linkage group.
The factor *H* for water absorbing capacity belongs to linkage group 1, and is linked with the factor *T* for hair colour with a cross-over value of 34·82%.
Determinate fruiting habit was found to be associated with time of flowering and plant height. All plants with a determinate fruiting habit are comparatively short and early flowering.
The wild prototype of seed coat colour is black.
In 14 out of 15 characters studied the wild type is dominant over the cultivated. The only exception is the character of upright hairs determined by a recessive gene, designated *a*.

569. ARONČUK, M. M. 635.655:575.257"793":635.657
(Change of the vegetation period in soya bean by means of vegetative hybridization).
Agrobiologija (Agrobiology) 1946 : No. 3 : 145–49.

Soya bean embryos were grafted on to cotyledons of *Cicer arietinum*. Five of the grafted plants flowered on 20 July, while the remainder flowered on 30 July, at the same time as the controls. Each of the five early flowering plants formed one pod, which contained one ripe seed which was picked on 1 Oct.; the others failed to reach maturity. Four of the five seeds obtained were sown, together with ordinary seed of the same variety as control. The four experimental plants flowered on 25 July, the controls on 3 Aug. Ripe seeds were harvested from the experimental plants and again the controls failed to mature; this time three of the experimental plants bore two pods, each with two seeds. These were sown the following spring and again formed ripe seeds, varying in number from three to ten per plant, with an average of 4·75. The two best plants produced 18 grains and these were sown and gave rise to plants bearing from two to eight pods per plant and from two to 15 seeds. The two best plants bore 23 seeds, which gave rise to plants which ripened seeds on 26 Sept. 1944; this year for the first time the plants shed their leaves at maturity. The number of pods per plant varied from two to 21, the number of seeds from three to 30. Seed from the best two

plants was sown in 1945 and in spite of a cold summer seed again ripened on 26 Sept.; the number of pods per plant was three to 28, the number of seeds six to 49.

570. Weiss, M. G.,
Weber, C. R. and
Kalton, R. R. 635.655:575.42
635.655:575.125
Early generation testing in soybeans.
J. Amer. Soc. Agron. 1947 : **39** : 791–811.

Methods recommended by different authors for evaluating the potentialitites of segregates in early generations are discussed. To obtain information on this problem in the case of soya beans the progeny of seventeen crosses between nine varieties were studied. The degree of heterosis in the F_1 was found to be of limited value in predicting the yield potentialities of the crosses. Means of individual F_2 plant determinations, however, gave significant intercross information on yield, maturity date and lodging resistance of final selections. Bulk population tests were of little value in the prediction of potential yield and date of maturity but gave fairly accurate indications of potential lodging resistance and height of subsequent selections. It was noted that late maturing genotypes consistently grew taller and were more susceptible to lodging than early maturing genotypes. The advanced generation yields were very irregular owing to natural selection. Individual maturity date determinations were a reliable indication of the maturity date of subsequent progenies. Yield determinations gave moderate and lodging scores poor estimates of progeny performance. Replicated progeny tests of F_2 and F_3 plants, regardless of season, were a reliable basis for the prediction of dates of maturity, plant height and lodging resistance. Owing to the variability in yields caused by seasonal fluctuations, single season evaluation of lines for yield was not reliable, but, after the F_3 generation, selection of lines on the basis of yield seemed to involve no greater risk of misclassification than selecting among homozygous varieties.

571. Schad, C.,
Mayer, R. and
Hugues, P. 635.655:578.088(44)
Les variétés de soya cultivées en France. **(The varieties of soya bean cultivated in France).**
Groupement Interprofessionnel Oléagineux Métropolitains 1945 :
Pp. 39.

Lists are given of varieties best suited for cultivation in the different climatic regions of France. The yield and vegetative period of different varieties are compared. A catalogue of varieties, including their origin and synonyms and a key for identifying varieties, is followed by a description of each.

572. Caldwell, J. S.,
Culpepper, C. W.,
Hutchins, M. C.,
Ezell, B. D. and
Wilcox, M. S. 635.655:581.6(73)
Dehydration of green vegetable soybeans.
Canner 1947 : **105** : No. 10 : 13–16, 24; No. 11 : 13–14, 16, 26; No. 12 : 15–16, 18; No. 13 : 35–36.

Experiments were carried out on 19 soya bean varieties and strains to compare the quality of dehydrated green beans with that of mature dry beans and canned green beans.
In both the mature dry and dehydrated green beans, the varietal differences in quality were small. The comparative desirability of the different varieties as dehydrated green and as mature dry beans showed little or no correlation. The canned material was confined to three varieties only. The general conclusion was reached that the mature dry beans were slightly more desirable as a food product than the dehydrated green beans, and that the latter were more desirable than the canned green beans.

573. Shih, C. Y. 635.655–1.557:519.241.1(51)
(Correlation between vegetative characters and yield of soya bean).
Northw. Agric. 1947 : **2** : 23–25.

Field observations were made on ten varieties of soya bean. Positive correlations were found between yield and (1) plant height, (2) number of branches, (3) seed size, (4) seed number, (5) seed weight, (6) pod number and (7) number of empty pods. The last character is believed to be due to insufficient nourishment, and it should not therefore be regarded as an undesirable genetical character.

574. Lehman, S. G. 635.655–2.421.1–1.521.6(75.6)
Powdery mildew of soybean.
Phytopathology 1947 : **37** : p. 434. (Abst.).

It is noted that in field and greenhouse inoculations with powdery mildew fungus (*Microsphaera*) the Biloxi, CNS, Haberlandt, Roanoke, Rokusun, S–100, Volstate and Woods Yellow soya bean varieties, and several hybrid selections have remained free of the disease.

575. Adair, C. R. 635.655.00.14(73)
Babes in soyland.
Sth. Seedsman 1947 : **10** : No. 8 : 15, 54.

The results of trials in Arkansas of the following recently developed soya bean varieties and strains with high oil content are briefly discussed: S 100, Arksoy 2913, Dortchsoy No. 7, Dortchsoy No. 2, Burdette No. 19, Ogden, Volstate, Roanoke, Mamloxi and Mamotan 6640. The hay type varieties, Red Tanner, Acadian and Gatan, were also included in the trials.

576. Hvatova, K. A. 635.656:575(47)
(New pea varieties from the Leningrad State Breeding Station).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : No. **6** : 65–66.

In the last six years the best yields have been given by the pea variety Zolotoĭ II [Golden II], a selection made at the Leningrad State Breeding Station from Zolotoĭ Engeljgardovskiĭ [Engelhard's Golden]. It has given an average yield of 19·05 c. per ha., which is 17% higher than that of the standard varieties, which it also excels in size of seed, cooking capacity and resistance to *Ascochyta*. It ripens 4–5 days later than the Swedish variety Kapital.

Another promising variety produced by the station is Snežinka [Snow Maiden], a hybrid from Irlandec [Irishman] x Četvergovyĭ [Thursday]. It is an early variety and has exceeded Kapital in yield, resistance to *Ascochyta* and protein content.

577. 635.656·575"793"(48.1)
Bremer, A. H. 635.656.00.14(48.1)
Sukkererter med store skolmer. **(Sugar peas with large pods).**
Meld. Stat. Hagebruksskoler Stat. Forsøksstasjoner Hagebruk 1938 (1939).
Tillegg G till Landbruksdirektørens årsmelding 1938 : G38–G42.

Trials of early sugar peas in Norway have shown that contrary to some opinions, the low-growing (dwarf or creeping) sugar pea, Tidleg Lav Sukkerert, is lower yielding and later than Tidleg Sabel [Early Sword], the former yielding 180 grm. per 100 pods as compared with 410 grm. per 100 pods for the latter.

Other high yielding early varieties developed in Norway are: the Norrland Sugar pea, with yellow pods, Rembrandt, Engelsk Sabel Oppegård 61, and L 1, a promising line resembling the French variety Maussanne but having bigger pods, like the French variety Carouby.

Since 1928, Norwegian breeders have been trying to produce a low-growing snap sugar-pea from a cross of Crochu Roi des Gourmands with Låg Margsukkerert [Short Marrow-fat Sugar]. The F_2 in 1930 showed that the snap, sugar-pea character was recessive to the Sabel sugar-pea type. Short internodes are also recessive and, so only one in every 16 plants would be a short, snap sugar-pea. Subsequent selection of this latter type gave a line with wrinkled seed, a short, snap, marrow-fat, sugar pea. This was multiplied up, and in variety trials, which included the tall, snap, sugar-pea Flandria, yielded 1320 kg. of green pods as compared with 1270 kg from Engelsk Sabel 0·61, 1130 kg from Tidleg Sabel

(Kvithamar) and 1400 kg. from the Kvithamar Låg Kjempesukkerert [Short, Snap, Giant Sugar Pea]. Flandria, however, showed a 100-pod weight of 1100 grm. as compared with 750 grm. for the Kvithamar short, snap variety. It is to undergo further tests with the Swedish varieties Apollo and Olympia and the Finnish semi-tall type, Suomi.

578. W....., T. A. 635.656–1.557
Multipodded green peas.
Home Gdn 1945 : **5** : No. **1** : p. 29.

Reference is made to the production at the Cambridge Horticultural Research Station of a pea variety bearing up to six pods per stem. It is described as a small type typical canning pea, growing about two feet tall.

579. 635.656–2.482–1.521.6
633.378–2.482–1.521.6
635.656–2.421.9–1.521.6
WEIMER, J. L. 633.378–2.421.9–1.521.6
Resistance of *Lathyrus* spp. and *Pisum* spp. to *Ascochyta pinodella* and *Mycosphaerella pinodes*.
J. Agric. Res. 1947 : **75** : 181–90.

Ten years' tests of varieties and strains of field and garden peas for resistance to *A. pinodella*, L. K. Jones, and *M. pinodes*, (Berk. and Blox.) Vest., are reported. None of the *Pisum* samples showed appreciably greater resistance than Austrian Winter. The strain of *L. hirsutus* used proved immune, that of *L. sativus* resistant and that of *L. tingitanus* moderately resistant. Attempts to cross these with the Austrian Winter pea failed.

580. MALTAIS, J. B. 635.656–2.7–1.521.6:575.12
Nouvelle sélection de pois résistante au puceron *Illinoia pisi* Kalt.
(**A new selection of pea resistant to the aphid *I. pisi* Kalt**).
Ann. Ass. Canad. Fr. Advanc. Sci. Montréal 1943 : **9** : p. 133.

The variety Champion of England, which shows a marked resistance to *I. pisi*, was crossed with another variety, H–103, producing a pea selection with several desirable qualities which make it of economic value. Its characters proved constant to the seventh generation.

581. MALTAIS, J. B. 635.656–2.7–1.521.6:581.192
Résistance relative de certaines variétés de pois aux attaques du puceron *Illinoia pisi* par rapport à la teneur en azote total de la sève. (**Relative resistance of certain pea varieties to the attacks of the aphid *I. pisi* with regard to the total nitrogen content of the sap.**)
Ann. Ass. Canad. Fr. Advanc. Sci. Montréal 1945 : **11** : p. 107.

Samples of the pea varieties Champion of England, Hybrid 103 and Perfection were found to support an average population of 14·5, 31·5 and 86·9 aphids respectively, these numbers being directly proportional to the total nitrogen content of the sap.

582. 635.656.00.14(48.1)
BJAANES, M. 635.656.00.14(47.1)
Forsøk med ertesorter. (**Trials with varieties of peas**).
Meld Stat. Forsoks. Moistad 1940 (1941) : H86–H89.
Meld. Stat. Forsøksstasjoner Plantekult. 1940 (1942).

From 1935 to 1940 trials were conducted with the Svalöf peas, Torsdagsärt II [Thursday II], Concordia and the large seeded, yellowish-green coloured Gröpärt [Groats Pea]; the Norwegian yellow Onsrud pea and the Norsk Grønnert [Norwegian Green Pea]; and from 1939 onwards, with, in addition, the green Quivisto [? = Koivisto] pea from Jokioinen in Finland.

Torsdag II, which gave the highest yield of seeds and also ripened earliest, is an easily cooked pea of fine flavour. Onsrud, which is nearly as early, gave too low a yield.

The Norsk Grønnert is early, with rather small seeds and though much below Torsdag II in yield, can be recommended where the latter is too late and conditions not sufficiently good.

Gröpärt is very productive, but practically a fodder pea and fairly late.

Quivisto, though not tested for long, appears promising.

583. GENERALOV, G. F. 635.658(47)
(The best varieties of lentils on the collective farm fields).
Selekcija i Semenovodstvo (Breeding and Seed Growing) 1946 : **13** : Nos 7–8 : 68–70.

The main zones of lentil cultivation in the U.S.S.R. are defined. Descriptions are given of the best varieties; one of the most promising is Petrov 4/105, a high yielding, mid-early, rust-resistant variety, with yellowish green seeds and a thousand seed weight of 55–65 grm.

584. TRAUTMANN, R. 635.72:575.255
A borsosmenta elfajzásáról. **(The reversion of *Mentha piperita*).**
Bull. Hung. Coll. Hort. Vinecult. 1944 : **10** : 203–08.

The author considers *M. piperita* to be a mosaic hybrid of *M. viridis* and *M. aquatica*. Reversions to the latter species are probably only seldom recorded because their smell is similar to that of *M. piperita*. The author suggests that the reversion is vegetative and is probably caused by different chemical composition of the soil. Suggestions for experiments are given. E. E.

CRAMÉR, H.
Mathematical methods of statistics.
Princeton University Press 1946 : $6.00 : Pp. xvi + 575 : tables. (No. 9 in Princeton Mathematical Series).

There has in the past tended to be a certain hiatus between the work of the students of probability theory on the one hand and the exponents of modern statistical techniques on the other. The former, especially the French and Russian mathematicians, have been engaged in placing the classical calculus of probability on a sound theoretical basis and have constructed self-consistent systems, whose theorems have been rigorously deduced from certain fundamental axioms. In contrast to these rather abstract studies, the British and American statisticians have been occupied with essentially practical problems such as tests of significance and the design of experiments. They have often developed their methods, by no means unsuccessfully, along somewhat intuitive lines without a very critical analysis of their fundamental assumptions, and have not always made clear the distinction between the subject matter of their investigations and the statistical principles involved. The disadvantage here is that, as the subject increases in complexity, divergent opinions are harder to reconcile, and the techniques themselves are less able to meet adverse criticism because of the lack of clarity of their logical presuppositions. This confusion makes further progress difficult and uncertain.

In the present book, H. Cramér, who is Professor of Actuarial Mathematics and Mathematical Statistics at the University of Stockholm and is the author of the Cambridge Tract on *Random Variables and Probability Distributions* (1937), shows how these two divergent lines of development, the abstract and the practical, may be brought together. He presents a unified treatment of mathematical statistics, in which the calculus of probability forms the theoretical foundation, while statistical techniques are exhibited as applications. In this way the assumptions of the latter are made explicit, and, now assured of mutual consistence, can be confidently used as a basis for further development and are more easily susceptible of general application. It would be idle to suggest that all the difficulties have been resolved, but it is true to say that considerable progress has been made in the process of clarification.

The book is divided into three parts. The first, "Mathematical Introduction", has chapters on set theory, the theory of Lebesgue measure and integration, and on various additional topics which are relevant to the subsequent treatment, such as Fourier integrals, matrices, beta and gamma functions, etc. The second part, entitled "Random Variables and Probability Distributions", provides the connecting link between probability theory and statistics. It deals with statistical regularity, independence, the central limit theorem, correlation and regression, and other subjects. A fair amount of space is devoted to the normal distribution because of its practical importance, and Cramér discusses the theoretical and experimental justification of the emphasis laid on this distribution. Finally, the third part, "Statistical Inference," is concerned with sampling distributions, the problem of estimation, tests of significance and the general theory of testing statistical hypotheses. Sheppard's corrections, goodness of fit, the method of maximum likelihood, confidence regions, etc., all receive their share of rigorous exposition. The two final chapters are devoted to the analysis of variance and regression problems respectively.

The book contains numerous interesting examples, historical notes and references to the literature. Tables of the normal distribution, percentage points of the χ^2 and t distribution and a bibliography provide useful appendices.

In order to keep the size of the book "within reasonable limits" the author regrets having to exclude certain important subjects such as the theory of random processes, statistical time series and periodogram analysis. In view of the excellent treatment accorded to the subjects actually dealt with it seems a pity not to have made part three more complete by the inclusion of these other subjects. The amount of space devoted to Lebesgue measure and integration seems somewhat disproportionate, and it would perhaps have been better to have curtailed part one so as to enable subjects such as stochastic processes to have found a place in part three.

While this book is clearly not intended for the experimenter who merely requires to be acquainted with a number of practical statistical techniques, it will be welcomed by the mathematical statistician who aims at a deeper understanding of the theoretical foundations of his subject. Although Professor Cramér in his book does not cover so wide a range of modern statistical methods as Wilks does, for instance, in his "Mathematical Statistics", his treatment throughout is clear and lucid, and this excellent book will undoubtedly become a standard work of reference. N. T. J. B.

VAN DER WERFF, J. TH. 537.531
De biologische werking der Röntgenstralen. (**The biological action of Röntgen rays**).
H. J. Paris, Amsterdam 1942 : Pp. 76 : 14 figs.

The author starts out from the idea that the enormous effect of X-rays on a biological object cannot be accounted for solely on the basis of their quanta structure, but only by giving equal consideration to the infinitely complicated, though at the same time incomparably harmonious structure of the living being. However complicated a living organism may be, it is an ordered entity and, where there is order, there are certain laws, and these must be expressible in mathematical forms.

After a brief survey of existing theories, he concludes that that developed by Sievert, although a step in the direction of the formulation of a mathematical theory to describe the reaction phenomena shown by the complicated interrelations of a living organism, is based on untenable hypotheses.

In formulating such a theory, two questions present themselves: (*a*) At what point do the rays attack and what happens there? (*b*) What connexion is there between the primary influence and the biological effect produced?

The author has considered the latter question and developed a mathematical theory based on the power of adaptation of the living organism and the compensatory reaction shown by reserves from which matter damaged by the rays is reproduced. The theoretical curves constructed according to this theory agree well with curves of the reaction obtained in many experiments, particularly those on the growth rate of *Phycomyces Blakesleeanus*, obtained by Arne Forssberg.

The theory also gives a better idea of the effects of radiation on blood-forming organs in the case of leukemia and is of value in considering the problem of the "time factor" or effect of changing the duration of radiation when a constant dose is given.

Since this thesis appeared the author has extended and modified the theory in some respects. He expects shortly to publish his latest ideas. C. B.

HAYES, H. K.,
IMMER, F. R. and
MARINO, A. E. (Translator). 575 : 633(8)
Métodos fitotécnicos. (**Plant breeding methods**).
Acme Agency, Buenos Aires 1943 : $28 : Pp. xxviii + 521 : 37 figs : and 89 tables.

The enterprising work of the Acme Agency of Buenos Aires in publishing biological and agricultural treatises in Spanish has already been referred to in the pages of *Plant Breeding Abstracts*. The latest publication that has been received is a translation by Professor Marino of Hayes and Immer's standard text-book on plant breeding methods (cf. *Plant Breeding Abstracts* Vol. XIII, p. 95).

This translation shows every sign of having been made with great care, so that the Spanish text should represent as accurate a translation of the original as possible. The translation is quite free on occasion, and frequently amplifies the rather compressed sentences of the original. These modifications, however, are to the benefit of the reader.

Footnotes are added by the translator on difficult points of translation, especially technical terms and the names of plant diseases. In general, the translator has been very successful in his handling of plant breeding and genetical jargon, although one wonders whether the term "crossing-over" could not be expressed by a more elegant Castilian term than "crosinover".

There is still room for improvement, however, on the printing side. Adjacent pages are sometimes set up in founts of different sizes for no apparent reason, and the reproductions of photographs are not good.

As a guide to plant breeding methods in South America, this translation should prove extremely valuable. There is a preface to the translation by Professor Horovitz.

GATES, R. R. 575.1

Human genetics.

The Macmillan Company, New York 1946: $15 : Vol. 1–2: Pp. 1518: 326 figs: 42 tables.

The first thing that strikes one about this book is the extraordinarily wide field covered by it. The labour which must have been involved in the mere collection of the references, to say nothing of summarizing the papers, entitles Professor Ruggles Gates to the gratitude of all concerned with human genetics. In 31 chapters the book covers practically everything about the human body and its physiology, behaviour and psychology which has been shown or suspected to be influenced by heredity; results from other organisms, especially mammals, are also used to illuminate the human data in many cases. The text is illustrated by photographs and pedigrees, all references are given in full and a combined subject and author index is provided.

It is almost inevitable that a book which makes such a feature of comprehensiveness must suffer in some other respects. In this case one feels that there has been a tendency to review all the work on any particular topic and leave it to the reader to evaluate it by referring to the original papers; certainly, in many sections, the number of alternative schemes of inheritance presented is almost bewildering and the reader's task is not made easier by the author's frequent interpolation of data of doubtful relevance to the section concerned. In some cases the author has intervened with his own explanation of apparently conflicting results, but it is doubtful whether his explanations are always justified by the evidence. For example a plant geneticist would certainly require better evidence before assuming, as the author is very ready to do, that there has been reciprocal translocation between chromosomes.

Be that as it may, there can be no doubt that this is a very valuable addition to the source-books of genetics. J. L. F.

POPOWSKI, A. 575.1(47)

Gesetze des lebens. (**Laws of life**).

Aufbau-Verlag, Berlin 1946 : Pp. 93.

Under this somewhat unexpected title, German readers are introduced to the life and achievements of Trofim Denisovič Lysenko.

Mr Popowski's delineation of the life of Pavlov has already been translated into German and published by Aufbau-Verlag. His account of Lysenko forms a companion volume, and is intended, like its predecessor, to bring home to German readers the essence of Russian revolutionary science.

Gesetze des Lebens is not a treatise. It is a biographical sketch, written in novel form and in conversational style. None the less, Lysenko's principal genetical theories duly appear, and readers of *Plant Breeding Abstracts* will meet once again the theory of phasic development and its application to plant breeding, the transmutation of summer wheats to winter wheats and vice versa by means of vernalization techniques, summer sowing of potatoes in southern Russia for preventing degeneration, intravarietal crossing, selective fertilization, and modification of hereditary constitution by means of grafting.

Personalities beside the central figure of Lysenko himself are lightly drawn. Kolesnik, Gluščenko and Avakjan, all faithful disciples of their master, emerge at various stages in the narrative, while always in the background are the traditional geneticists, bookwise, carping with their Greek and Latin terms, their mania for control experiments, and their professional antipathy for all those who are not ashamed to proclaim that the benefit of mankind is the object of their labours.

Against this hostile background Lysenko stands out in striking contrast. He does not pore over the literature; he is to be found in the fields, working on his plots, and considering

how best he may achieve the practical tasks before him. Neither will he be discovered glued to a microscope; his results are new varieties, heavier yields and hardier crops.
In Germany, Lysenko's name has till now been little more than heard of, and then only as a mysterious figure whose achievements seemed shrouded in the obscurity of legend. It is to dissipate this impression that Mr Popowski's novel has been translated, and it is likely by its lightness of touch to intrigue both those who have a scientific interest in Lysenko himself, and also that much wider circle who, knowing little science, are yet anxious to acquaint themselves with its spirit and achievements.

575.1:007(47)

(Agrobiology).
Ogiz, Seljhozgiz, Moscow 1946 : Pp. 408 : 56 figs, 2 tables.

In accordance with the Russian custom of bringing out editions of the collected works of their outstanding figures, a selection has now been published of the works of Trofim Denisovič Lysenko.
The period covered is from 1936, when Lysenko's work was becoming a matter of intense national interest, to 1946. The titles of the papers reprinted are as follows: The Theoretical Basis of Vernalization, Plant Breeding and the Theory of Phasic Development (this paper was written in collaboration with Prezent), On the reconstruction of Seed Production, Intravarietal Crossing of Self-pollinated Plants, On two Directions in Genetics, Collective Farm Hut Laboratories and Agrobiological Science, Intravarietal Crossing and the Mendelian "Law" of Segregation, The Mentor a Powerful Method in Breeding, The Mičurin Theory the Basis of Seed Production, The Creator of Soviet Agrobiology, The Mičurin Doctrine at the All-Russian Agricultural Exhibition, The Ways of Controlling Plant Organisms, New Achievements in Controlling the Nature of Plants, The Organism and the Environment, Engels and Certain Questions of Darwinism, What is Mičurin's Genetics, Timirjazev and the Problems of Our Agrobiology, On Inheritance and its Variability (recently translated by Dobzhansky), and Natural Selection and Intraspecific Competition.
The papers selected form a representative collection of Lysenko's articles, and cover most of the major aspects of his work. The more important of these papers have already been summarized in *Plant Breeding Abstracts*; the significance of Lysenko's theories has also been considered in a recent publication from this Bureau by Hudson and Richens (cf. *Plant Breeding Abstracts* Vol. XVI, p. 365).
A useful catalogue of all the articles published by Lysenko up to the middle of 1946 concludes the volume.

Babcock, E. B. 576.12:582
The Genus *Crepis*. Part I.
The taxonomy, phylogeny, distribution, and evolution of *Crepis*.
University of California Press, Berkeley and Los Angeles. 1947 : **21** : $3.50 : Pp. xii + 198 : 11 figs. 12 tables. 2 plates.

Babcock, E. B.
The Genus *Crepis*. Part II.
Systematic treatment.
Ibid. 1947 : **22** : $10.00 : Pp. x + 199–1030 : 35 plates : 12–294 figs: 7 tables.

In 1918, the Californian Agricultural Experiment Station decided to sponsor a programme of genetical research work on the genus *Crepis* under the direction of Professor Babcock. Since that time, many discoveries of fundamental importance to genetics and botany have been made using this material, and the most important of these have been brought together in the two volume-monograph of the genus that has just appeared. The whole work is cast on a monumental scale, and forms a permanent tribute, both to the enlightened attitude of the Californian Agricultural Experiment Station to pure science and to the indefatigable research work of Professor Babcock and his many associaties.
In volume I of the monograph, the results of general biological interest are gathered together. As far as taxonomy is concerned, the author exposes the shallowness of a pure morphological approach, and shows that a satisfactory scheme of classification can only be

devised if cytological, genetic and phytogeographical data are taken into consideration. It is shown, for instance, that several characteristics commonly regarded as sufficient to diagnose a genus are determined by a single factor only, and may, moreover, occur in related genera. In his treatment of taxonomic categories, the author follows quite closely the scheme set out in the valuable paper by Camp and Gilley on "The Structure and Origin of Species" (cf. *Plant Breeding Abstracts* Vol. XIV, Abst. 789). The great importance of realizing that the ordinary taxonomic species includes many fundamentally different types of natural assemblage is strikingly borne out by Professor Babcock's account. The introduction, however, to chapter 2 on the "reality" of genera and species hardly gets to the root of the problem.

Chapters 3 and 4 of the first volume deal with the phylogenetic trends that have been discovered within *Crepis*, as regards both morphological and cytological characters, but by far and away the most stimulating part of this volume is the series of chapters dealing with the origin, evolution and migration of *Crepis* from its Centre of Origin, which is tentatively located in Central Asia in the Miocene Era. The way in which the complex problem of the evolutionary development and migrations of the various species is handled is masterly, and draws upon the evidence of the present-day taxonomy, morphology, cytology and geographical distribution of *Crepis*, upon geological evidence on the land routes available for migration throughout the Tertiary and Recent Periods, upon palaeobotanical records of *Crepis* species, and upon the evidence provided by the distribution of other plants.

The conclusion reached by the author as to the origin and migration of *Crepis* spp. is succinctly expressed in the diagram on p. 152 of the first volume. Four main migration routes from Central Asia are suggested: (1) a westerly route to northern Europe via Russia, (2) a north-easterly route to the Far East, and via the mid-Tertiary Behring land connexion to North America, (3) a south-easterly route of minor importance to south-east Asia, and (4) a south-westerly route of great importance along the mid-Tertiary land connexion between Central Asia and the Mediterranean region. The great importance of this scheme is that, if true, it will apply also to a great many other angiosperms, and will be highly relevant, as the author points out, to theories on the origin of the angiosperms.

It is naturally extremely difficult at the moment to assess the cogency of all the arguments that Professor Babcock brings to bear on his problem. Anything approaching assurance on the matter will only be possible if monographic work along parallel lines, but with other groups of plants, results in similar conclusions. Professor Babcock, however, makes very little use of the rather *a priori* theories of plant geography that are popular to-day. Even with regard to Vavilov, he shows that generalization based on the distribution of variation may be susceptible of more than one interpretation.

Volume II of the monograph is a model taxonomic treatise. Each of the species of *Crepis* is described very fully and illustrated, including figures of the caryotypes when known. Maps are given showing the distribution of the species in each section of the genus, and after each species, notes are added on its taxonomic status and relationships. The whole account is hardly equalled elsewhere in the taxonomic literature.

Only a specialist in the taxonomy of the Compositae could really appreciate to the full the second volume of Professor Babcock's monograph, but the first volume can be read with interest and profit by all those interested in the evolution, genetics and improvement of plants. Professor Babcock's work has inspired many biologists to work with the same material, and among these it is fitting to recall the name of Dr Navašin, whose cytological studies have proved so fruitful. The significance of the *Crepis* work however extends far beyond its own limits, and Professor Babcock has now assembled it in such a form that it may be readily utilized and appreciated by all those who work in any way with plants.

PHILLIPS, M. E. and
COX, L. E. 58
Manual of botany.
University of London Press, Ltd., London. 1947 : 18s. Pp. viii + 384 : 317 figs.

The greater part of this text book is devoted to systematic botany and should serve its purpose adequately. Plant physiology, anatomy, cytology, genetics and evolution are the

other subjects included. With a few exceptions, the numerous diagrams illustrating the text are both clear and accurate.

A serious deficiency in a text book of this kind, intended primarily for the use of first year university students, is the omission of a bibliography; the necessarily cursory treatment of the various topics, some of which are rather oversimplified, should be compensated for by references to sources of more detailed information, and the reader should not be expected to accept theories and results without being given some authority for them.

Apparently the information given has been largely drawn from other text books with the result that some of it is out of date. It is stated, for instance, that some modern workers are of the opinion that the chromosomes run together in the resting nucleus to form a reticulum and that others consider the resting nucleus completely homogeneous! "The first indication of Prophase", we are told . . . "is that the karyotin loses its reticulate pattern and has the appearance of a tangled coil, the spireme. Later this separates into short threads, the chromosomes". It is stated, too, that "there are reasons for supposing that . . . the chromosomes are . . . genes", and that "the theory of dominance has given place to the Presence and Absence Theory".

There are a few instances of a rather indiscriminate use of terms; for example, no distinction is made between flagella and cilia, between root pressure and suction pressure, or between translocation and crossing over.

An index is appended.

McLean, R. C. and
Ivimey Cook, W. R. 581.5
Practical field ecology.
George Allen and Unwin Ltd. 1946 : 9s. Pp. 207 : 50 figs.

The intention of the authors in writing this book was to provide a guide to ecological survey work for use in the field, a task which they have accomplished admirably. The clearness of the instructions, the emphasis on the most important points, the attention to necessary details and the exclusion of all that is irrelevant bear witness to their long experience in explaining the procedure to students and in directing field work. The amount of information which has been included in so small a book is astonishing; no words are wasted and yet the style is by no means so condensed as to make heavy reading. A useful feature is the inclusion of keys for the identification of grasses not in flower, of the chief genera of marine Algae and of the common genera of the higher Basidiomycetes. The apparatus described and illustrated will be beyond the means of some readers, but the book will nevertheless be useful to those with simpler tools. One gets the impression that the authors' own students at Cardiff really enjoy themselves on ecological excursions, and readers of this book will probably share the sentiments of some of them who declared after field classes that they "never thought botany could be half so interesting".

Tansley, A. G. 581.5
Introduction to plant ecology.
George Allen and Unwin Ltd., London. 1946 : 8s. 6d. Pp. 260. 14 figs.

The author's previous work *Practical Plant Ecology* forms the basis of this book.

Part I deals with the meaning and scope of ecology, which is regarded, in the wide sense, as "a means of approach to a large part of detailed botanical study" or "a synthesis of the special knowledge obtained by the study of particular departments of botany in relation to the life of plants in their natural habitats", definitions which perhaps lead the reader to hope for a broader treatment of the subject than is given in the succeeding chapters. The effects of human activity on natural communities are briefly discussed in the second chapter, these and other environmental effects being examined in more detail in Part II which deals with the structure, distribution and development of vegetation.

The chapters on different kinds of plant communities and on the succession of vegetation are well arranged, concise and to the point. The reader is introduced to several ecological terms which are clearly defined and illustrated by definite examples. Subsequent reference to these definitions is facilitated by the provision of an index. Chapter V, on life forms, corresponds to part of the appendix of *Practical Plant Ecology* which has been rewritten

and expanded, and Chapter VI gives a brief outline of the nature and general relationships of the chief types of British vegetation.

In Part III the methods of studying vegetation by the making of maps and charts are discussed. The instructions are very detailed, and are well illustrated by examples of different kinds of charts. Emphasis is duly laid on the necessity of keeping a definite aim in view, but the small amount of space devoted to the drawing of conclusions from the data acquired compared with that given to the actual acquiring of the data is hardly calculated to impress this necessity on the mind of the student. The defensive attitude assumed by the author in justifying the time spent on the charting of vegetation is a little surprising, as it tends to imply that ecological work is really rather a waste of time, but has, nevertheless, certain features to recommend it. A fuller discussion of the devising of field experiments and the problems which can be solved in this way would be interesting. The subject of autecology would also seem to merit more attention. The sections on surveying small areas and the photography of vegetation which formed part of the appendix in *Practical Plant Ecology* have been incorporated with some alterations into the body of the book.

Part IV is an elementary treatment of habitat analysis with sections on climatic, physiographic, edaphic and biotic factors. An up-to-date theoretical treatment of soil is given and brief instructions are included for some simple field and laboratory tests, reference being made to others which require more elaborate methods. Some of the practical work on soils described in *Practical Plant Ecology* is omitted.

The suggestions in Part V as to the ways in which ecology can be taught in schools should be of use to teachers in all types of schools where there are facilities for nature study out of doors. A useful list of books and papers is appended, but unfortunately it does not include the dates of publication of some of them.

Moscoso, R. M. 582(72.9)
Catalogus florae domingensis. (**Catalogue of the flora of Hispaniola**).
University of Santo Domingo, N.Y. 1943 : Pp. xlviii + 732.

It has been long realized that the Antilles are of particular interest to students of the geography and evolutionary history of American plants. Information however on the floristics of these islands is very scattered and difficult to come by, except in certain cases. Dr Moscoso has now rectified this position with regard to the island of Hispaniola, and has brought out a valuable list of the wild and cultivated plants that grow there.

The catalogue is prefaced by an introduction in Spanish, describing the geography of the island, the history of its botanical exploration, and its botanical regions. The history of the botany of the island is a most useful account.

The bulk of the catalogue is in Latin, and includes all the gymnosperm and angiosperm species known in the island, arranged under their families. For each species an account is given of its synonymy, its geographical distribution within the island, its habitat, its habit (whether herb, shrub or tree), the colour of the flowers, occasionally supplemented by a brief botanical description, the phytogeographical status of the plant (whether cultivated, wild or endemic), its uses, and the Spanish and French creole vernacular names applied to it in the Dominican Republic and in Haiti respectively.

Reeves, R. G. and
Bain, D. C. 582(76.4)
A flora of South Central Texas.
The Exchange Store, Agricultural and Mechanical College of Texas, College Station, Texas 1946 : $3.90 : Pp. 298. (Mimeographed).

This flora has been produced to provide a manual for students wishing to identify the plants of Southern Central Texas. It has been compiled in a concise and business-like way, with keys to the families, genera and species, and succinct descriptions of each species. Many introduced species are included, though it is not always stated whether or not these are introduced. Only a selected list of grasses is given.

As the authors themselves remark in the preface, varieties are de-emphasized, a practice which has much in its favour in view of the variability and intergrading of many of the Texan species. The system of classification used is that of Bessey.

The authors make no claim that their flora is complete, but it should nevertheless perform admirably the function for which it was designed.

RICKETT, H. W. 631.524:007
The Royal Botanical Expedition to New Spain.
Chronica Botanica 1947 : **11** : 1–86.
Published by Chronica Botanica Co., Waltham, Mass. (price $2.50).

The material for this book has been collated from documents in the Archivo General de la Nación in Mexico. It is an account of the expedition sent by Charles III of Spain to survey the "natural products" of New Spain and to establish a botanical garden there. Although not devoid of botanical interest it is chiefly concerned with the members of the expedition, their difficulties, their quarrels and their complaints and the way they set about their work. The author tells, in a most interesting and amusing fashion, of the red tape with which Sessé and Cervantes had to grapple in setting up the botanical garden, of the endless controversies about salaries entered into by Senseve "a person of weak intellect and timid soul but intent on his rights", of the domestic troubles of Mocino whose wife sued for a separation a year after he began his studies at the Botanical Garden at Mexico, and of the insubordination of the zoologist, Longinos.
The account is fully documented.

DICKSON, J. G. 633–2–1.521.6
Diseases of field crops.
McGraw-Hill Book Company, Inc., London and N.Y. 1947 : 22s. 6d.
Pp. xii + 429 : 102 figs. tables.

A welcome is always assured to accurate and up-to-date information on the diseases of crop plants and the methods of combating them. *Diseases of Field Crops* by Dr James G. Dickson, professor of Plant Pathology in the University of Wisconsin, has developed from a series of mimeographed outlines extending over two decades. It will be especially welcomed by those who know the proven value of the author's *Outline of Diseases of Cereal and Forage Crop Plants*.
The present volume, covering crop diseases in all parts of the world, contains four sections, two appendices and an efficient index. Section one includes a general introduction and a chapter on the physiological anatomy of plant groups in relation to disease. It is regrettable that this aspect is too often forgotten in the teaching of plant pathology for, to quote Professor Dickson, "the importance of a basic understanding and experienced familiarity with the physiological anatomy of the plants upon which the disease occurs is essential in the comprehension of disease development and in the application of disease control". The second section deals with diseases of cereals and grasses (barley, maize, millet, oat, rice, rye, sorghums, Sudan grass, Johnson grass, sugar cane, wheat and forage grass). Legume diseases (lucerne, sweet clover, clover and soya bean) are described in the third section and the final one deals with cotton, flax and tobacco diseases. One of the appendices usefully lists the bacteria and fungi parasitic on field crops.
For each plant mentioned above there are introductory paragraphs concerning the crop, followed by the descriptions of the diseases arranged according to the primary causal agent, namely, non-parasitic causes, viruses, bacteria, fungi. For example, in dealing with wheat the chromosome groups of the genus *Triticum* are given accompanied by a brief discussion of winter, intermediate and spring types of the crop and the difficulties encountered by breeders in producing disease resistant plants. There then follows the description of 24 diseases.
Each chapter not only marshals a great many facts, presented in eminently readable form, but abounds in references and for this latter reason alone the book is a mine of information. Other attractive features are the numerous excellent illustrations and the inclusion of the diagnostic characters of the causal fungi.
Since Professor Dickson's book is the outcome of many years of teaching and research it is perhaps presumptuous to raise the voice of criticism. All concerned with teaching plant pathology must have encountered this Scylla and Charybdis—whether to present the subject on the basis of the classification of the causal agents or that of the host plants.

Each method has its limitation. Professor Dickson has chosen the latter method and obviously encountered its inherent difficulties. Basing classification on the host unavoidably entails repetition of information since many organisms attack several plants and the construction of a consecutive story thus enforces the retailing of the same facts. Such repetition may not be without value from the teaching point of view but, to those schooled in the traditional British approach to the subject, there will probably be a suspicion that this in so many ways admirable book would have been wholly so had it been arranged somewhat differently.

Perhaps the reviewer may express three entirely personal points of view: regret at the use of the word suscept instead of host since the former fails to flow easily from the English tongue; admiration for the American speed of teaching which permits Appendix A to be the suggested outline for a three-hour course; gratitude to Professor Dickson for forgoing author's royalties in order that the book might be published at a reasonable price.

Diseases of Field Crops will undoubtedly become a standard work of reference and should grace the bookshelves and be often in the hands of all those concerned with the health of crops.

M. A. K.

HUTCHINSON, J. B.,
SILOW, R. A. and
STEPHENS, S. G. 633.51:576.12

The evolution of *Gossypium* and the differentiation of the cultivated cottons.

Empire Cotton Growing Corporation. Oxford University Press, London 1947 : 15s. Pp. xi + 160 : 10 figs. 9 plates.

The Evolution of Gossypium undoubtedly represents one of the most valuable monographs that have appeared in recent years in the fields of genetics, evolutionary theory and practical plant breeding. As a result of just under twenty years' intensive research on cotton varieties and related plants, it has been found possible to integrate into a single picture the taxonomy, cytology, genetics, evolutionary history and breeding potentialities of *Gossypium*. As far as taxonomy is concerned, genetical studies have been used both to ascertain affinities and to test the taxonomic value of the various species described. As a result, the number of species accepted is reduced from over seventy to twenty. It is possible that rubricians may complain over some nomenclatural points, but in general the *International Rules of Botanical Nomenclature* have been followed as closely as is possible in the case of a genus including economic crop plants.

In their account of the evolutionary history of cotton, the authors have presented a study in which genetical, cytological, taxonomic and archaeological data are each drawn upon in turn. Two bold hypotheses are utilized, Wegener's theory of continental drift, and the diffusionist theory of trans-Pacific cultural contact between Eastern Asia and Peru.

By assuming that the land masses now forming South America, Africa, Arabia, Peninsular India and Australia were all contiguous in the Jurassic Era, and that an enormous desert area extended the whole way across this mass, it is plausible to locate the original diploid ($2n = 26$) *Gossypium* population in this tract, and to suppose that the present discontinuous and largely allopatric distribution of wild *Gossypium* species in the arid parts of Central and South America, Africa, south-western Asia and Australia, is a result of the fragmentation of this primeval continent.

The origin of true linted cottons is located in the Indus valley, from which cotton fabrics have been recovered dating from *c.* 3000 B.C. It is considered probable that these were derived from cotton species of the section Anomala which occur wild in Arabia and Africa. A coastal trade route linked the east African coast to southern Arabia and north-western India. From the Indus valley, cultivated diploid cottons probably spread to the other areas where they are now grown. It is worth noting, in passing, the comparative simplicity of the genetical difference between simple seed hairs and true lint.

Regarding the origin of the tetraploid New World cottons the authors administer a sharp shock to the advocates of the autochthonous development of pre-Columbian American civilization. They bring together all the evidence at their disposal to show that the A genome of the American tetraploids was carried over the Pacific by man, from Asia proper

moreover and not from Polynesia. It is then supposed that hybridization occurred in Peru, probably with the indigenous species *G. Raimondii* carrying the D genome, followed by chromosome doubling to give the present allotetraploids. It is clear that no future students of Inca civilization will be able to ignore the A genome of *G. barbadense.*

The whole monograph is of particular value for its discussion of evolutionary theory, especially the problem of evolution of an economic crop plant. So important are human factors in modifying the selective forces acting on cotton that archaeological and agricultural technological data must be utilized in arriving at a satisfactory account of the variability shown by present-day cotton varieties. Within the genus *Gossypium,* almost every stage in speciation as conceived along neo-Darwinian lines is discoverable. Consequently, the authors discountenance Goldschmidt's distinction between micro-evolution and macro-evolution. They also criticize those who belittle the role of polyploidy in evolution, and they show how polyploidy may provide material for fresh evolutionary advance. Vavilov's theory of Centres of Origin is frequently used, but it is pointed out nevertheless that fragmentation of populations due to terrain may give rise to a type of variability not to be confused with that characteristic of Centres of Origin. Finally, a very useful discussion precedes the conclusion of the book, pointing out how economic exploitation by man modifies the entire evolutionary prospect of a species.

Modern genetical theory has been extremely fortunate in the authors who have done most to expound it. *The Evolution of Gossypium* deserves to take an honoured place among the neo-Darwinian classics.

MORTON, K. and
MORTON, J. **634**

Fifty tropical fruits of Nassau.

Text House, Coral Gables, Florida 1946 : $3.50. Pp. 114 : 55 photos.

Although written primarily for the visitor to Nassau, this attractively illustrated book can hardly fail to interest those in other parts of the world who have heard of the fruits described without having the opportunity to see or taste them. It is pleasingly written in deliberately non-technical language and contains a wealth of information about the history, distribution, appearance, structure, time of ripening and uses of the amazing variety of fruits grown in the Bahamas. A few of these are not unfamiliar to the European reader and all of them are to be found in other tropical and subtropical areas of the British Empire. The botanical and the common names of each fruit are given at the beginning of the description, and the fifty-five photographs have been carefully planned to illustrate both external form and internal structure. The first-hand knowledge and research experience of the authors render them authorities on their subject, and the book can be recommended both as interesting reading and as a valuable work of reference.

HEDRICK, U. P. **634.8(73)**

Grapes and wines from home vineyards.

Oxford University Press, London 1945 : 18s. Pp. xiii + 326 : 37 figs : 24 plates.

An authority on fruit growing, Dr Hedrick has written a lively book for the amateur grape-grower and wine-maker in the United States, which is the quintessence of fifty years' experience and interest in viticulture and wine production. In his preface, Dr Hedrick quotes 30 million gallons of wine per year as the amount at present being made in American homes, and the aim in writing this simple but precisely informative book has been to encourage domestic wine production and to improve the quality. The book gives information on all aspects of amateur grape and wine production, with the piquancy of the connoisseur. Part I deals with different species of grape vine grown in the United States, and discusses the value of the most important varieties. It also gives practical instruction and advice on the culture of vines; and includes a chapter on grape breeding in the United States and hints for the amateur wishing to try his hand at improving his fruit by hybridization. Part II is concerned with wine production and the uses of wine. It contains a chapter on the general characteristics of American wines, and chapters on the home winery and production of the different types of wine. The book is brought to a triumphant

completion matching the exhilaration of the successful wine-maker by advice on the intricacies of serving wines, and also recipes for wine drinks and cooking recipes using wines which at least make possible an imaginary flight upon the part of the reader from the drabness of austerity.

634.9

The Empire Forestry Handbook 1946.
The Empire Forestry Association, The Royal Empire Society, London
1946 : 5th Ed. 10s. : Pp. xxiv + 163 + 78 : tables.

This is the fifth edition of the Empire Forestry Handbook. The general arrangement follows that used in previous years, but the scope of the Handbook has been considerably enlarged. A new section has been added to give the chief foreign forest research organizations. Another useful section provides details of the principal forestry periodicals of foreign countries. To avoid overlapping and repetition, the sections on Forest Officers of the Empire and Education and Research have been combined under the title, "Forest Services and Forest Research and Education Institutions of the Empire". Statistical formation on the forest resources of the Empire is now included in an expanded section concerned with forest resources of the world, prepared by Sir Hugh Watson. The section entitled "Useful Figures for Foresters" has been enlarged, and in addition to other useful data, now includes an explanation of the methods of round timber measurement most frequently in use in the Empire. Finally, since the British Standard Nomenclature of Hardwoods and Softwoods has now superseded the Trade Names of Empire Timbers, this standard nomenclature has been reproduced, in alphabetical order of botanical species; the list also includes the standard names accepted in Australia, South Africa and the United States, and the weight per cubic foot of each timber.

Meunier, G.,
Guinier, P. and
Regnier, R. 634.972.3(44)
Les peupliers français. **(The French poplars.)**
Editions de la Revue du Bois et de ses Applications, Paris 1947 : Pp. 35 :
71 photos. figs.

An important factor making for efficiency in wood industries is the utilization of the most suitable types of wood for the particular purpose for which it is required. The descriptions of the wood of different types of poplars presented in this bulletin should prove useful from this point of view but the information cannot be applied unless the different species and varieties can be identified. It is with this fact in mind that the author has explained how the poplars used for industrial purposes in France can be distinguished from one another. The information is based on research carried out by the authors. After describing and comparing the different poplars, the author deals with their geographical distribution in France showing how this is determined by their response to environmental conditions and by their industrial value. It is clear from the discussion of the qualities of the wood of the various types of poplar in relation to the demands of industry that the suitability of a tree for a particular purpose depends not only on the variety but also on the conditions of development. A chapter is therefore devoted to a discussion of the factors which must be taken into account in the cultivation of the trees.

The bulletin is illustrated by nineteen plates of well-produced photographs, and includes drawings of leaves and a map of France.

NEW JOURNALS

Agrártudományi Szemle

Agrártudományi Szemle (*Hungarian Review of Agrarian Sciences*) is published by the Hungarian Society for Promotion of Agriculture, and is claimed to be the first review of its kind to appear in Hungary. The first part of the journal is devoted to original scientific articles on agricultural subjects. The first issue contains two papers of particular interest to plant breeders: "Inbreeding of sugar beet", by K. Sedlmayr; and "Breeding of polyploid

flax", by B. Györffy. The second part deals with agricultural policies. English summaries are given of all contributions.
The journal is published bimonthly. The annual subscription is 72 Ft.; single copy 14 Ft. The publisher's address is Budapest, VII, Rumbach Sebestyén-u. 15/a.

The American Statistician

The American Statistical Association has recently initiated the publication of a new journal, *The American Statistician*. This journal does not replace any of the association's other periodicals, but complements these by providing an editorial medium in which the more general problems of interest to statisticians can be discussed. It is to be published bimonthly. The subscription rate is one dollar and fifty cents per year or twenty-five cents per copy.

NOTICE

In transliterating Russian and other Slav names from Cyrillic script a modification of the Damiani system, based on the Serbo-Croat scheme, is adopted in *Plant Breeding Abstracts*. The same system is used by the Commonwealth Bureaux of Animal Breeding and Genetics, Pastures and Field Crops, and Horticulture and Plantation Crops. When authors publish their work in languages using Roman script they frequently use a different system. In quoting the titles of such works in Plant Breeding Abstracts the author's own version will be employed but to avoid confusion the version according to the Bureaux system, where different, will be given in square brackets after the author's version, thus:—

Tzitzin [Cicin].

INDEX

Abegg, F. A., 368
Adair, C. R., 575
Addison, G., 61
Afzal, M., 325, 328
Agnel, H., 490
Ahsan-ul-Rahman, 325
Akeley, R. V., 301
Alderman, W. H., 440
Alexander, L. J., 554
Allard, H. A., 557
Almeida, C. R. Marques de, 434
Almeida Goes, L. A. de, see Goes, L. A. de Almeida
Andersson, E., 516
Anonymous, 11, 16–18, 22–23, 26–27, 29-41, 43, 51–53, 141, 144, 145, 160, 176, 190, 212, 216, 235, 255, 282, 305, 320–22, 337, 339, 344–45, 379, 381, 386, 430–31, 444, 486, 494–97, 503, 521, 525, 528, 534, p. 178, p. 185
[Anson, R. R.], 321
Aronĉuk, M. M., 569
Atwood, S. S., 465
Avakjan, A. A., 196
Avanesjan, D. V., Ter-, see Ter-Avanesjan, D. V.
Azizuddin Ahmad Siddiqi, 1

Babcock, E. B., p. 178
Bailey, L. H., 478
Bain, D. C., p. 181
Baker, H. G., 59
Balašev, L. L., 154
Ballard, W. W., 333
Balzli, J., 94
Bamberg, R. H., 184
Bangham, W. N., 422
Bateman, A. J., 102, 261
Battaglini, G., 204
Bawden, F. C., 128
Bazavluk, V. Ju., 549
Beadle, G. W., 122
Beal, J. M., 57
[Bebbington, A. G.], 321
Becker, J., 461
Bergdolt, E., 73
Berger, C. A., 96
Berhow, S., 463
Bernuth, I. von, 283
Bertalanffy, L. von, 99
Bessell, G. Haase-, see Haase-Bessell, G.
Bhaduri, P. N., 83
Bjaanes, M., 582
Björling, K., 173
Black, W., 303–04
Blackmon, G. H., 406, 412
Blake, M. A., 450
Bliss, G. I., 4
Bloch, R., 101
Blodgett, E. C., 286
Blondel, L., 453
Bockstahler, H. W., 372
Boczkowska, M., 309
Bode, O., 312
Boeuf, M. F., 132
Bohn, G. W., 552
[Bokil, S. O.], 11
Bonde, R., 301
Böning, K., 252
Bonvicini, M., 19
Boonstra, A. E. H. R., 13
Bos, J., 480
Bose, P. C., 83
Bouffil, F., 472
Bouriquet, G., 396
Bowen, J. S., 426
Bravo, A. F., 224
Bremer, A. H., 577
Brett, P. G. C., 347
Brewbaker, H. E., 366
Brink, R. A., 100
Briquet Junior, R., 63, 140
Broadfoot, W. C., 195
Brunson, A. M., 207
Buchholtz, W. F., 187
Burkholder, P. R., 117
Burton, G. W., 243
Bush, H. L., 366
Bustarret, J., 149

Caldwell, J. S., 572
Cameron, C., 357
[Cameron, G. S.], 321
Caminha Filho, A., 354
Camp, W. H., 111, 455
Carson, C. M., 270
Carter, W., 487
Carvalho, A., 387–88
Carvalho e Vasconcellos, J. de, see Vasconcellos, J. de Carvalho e
[Cassidy, B. J.], 39
Castro, D. de, 86
Castro, M. P. de, 67
Černý, M., 365
Chandler, F. B., 484
[Chandrasekar, C.], 11
Charmoy, D. d'Emmerez de, see Emmerez de Charmoy, D. d'
Chatterjee, D., 228
Chen, J. T., 218
Chevalier, A., 390, 395, 421, 473
Chevrette, J. E., 162
Chiang, P. C., 183, 400
Chinoy, J. J., 181
Christensen, N. A., 262
Christie, G. A., 350
Chu, F. M., 188
Churchill, B. R., 245
Cicin, N., 168
Cillis, U. de, 155
Cockerham, K. L., 319
Collins, J. L., 487
Cook, W. R., Ivimey, see Ivimey Cook, W. R.
Coons, G. H., 360, 368, 373
Cooper, D. C., 100
Cormany, C. E., 369
Correia, E. Margarido, 124
da Costa e Sousa, L. de O. Mendes, see Sousa, L. de O. Mendes da Costa e
Coste, A., 453, 527
Cotton, J. R., 332
Covas, G., 258
Cox, L. E., p. 179
Cramér, H., p. 175
Crane, M. B., 446
Cronquist, A., 427
Culpepper, C. W., 572
Currence, T. M., 531
Cvetuhin, see Tsvetoukhine

[Darain, R. D.], 11
Darlington, C. D., 44–45
Darpoux, H., 448
[Davidson, H.], 38
Davies, R. G., 46
Davies, W., 233
Dean, H. A., 335
Decoux, L., 358, 367, 376
Deen, O. T., 319
Delaunay, see Delone
Delone, L. N., 60
[Demerec, M.], 38–39
Deming, G. W., 370
Dermen, H., 441
Deshmukh, M. J., 399
Devi, P., 118
Dewey, S., 374
De Willigen, A. H. A., 297
Dickson, J. G., p. 182
Didusj, V. I., 60
Diehl, R., 316
[Dobzhansky, Th.], 38, 39
Dojarenko, E. A., 238–39
Dolan, D., 539
Dolgušin, D. A., 165
Domin, S. I., 291
Domingo, W. E., 398
Dominique, F., 500
Domokos, J., 530
Doxtator, C. W., 359
Dubuy, H. G., 127
Ducke, A., 423
[Ducker, H. C.], 321
Duffield, J. W., 515
Dulaney, E. L., 121
Dvorjankin, F. A., 76

Eĭhenbaum, E. V., 211
Eikeland, H. J., 277
Einset, J., 477
Ekstrand, H., 150, 198
Elle, Th., 273, 280
Emmerez de Charmoy, D. d', 342, 351
Epps, J. M., 540
Erkelens, M. A., 482
Erlee, T. J. D., 12
Ernould, L., 362
Eşberk, T., 336
Etchecopar, J. A., 416
Evans, H., 348
Evans, M. W., 242
[Evelyn, S. H.], 321
Evreinoff, V. A., 458
Ezell, B. D., 572
Ežov, V. A., 550

Fagerlind, F., 105
Fanelli, L., 471
Fano, U., 69
Fanshawe, D. B., 138
Fardy, A., 383, 529
Fauvel, J. H., 454
Favret, E. A., 217
Federer, W. T., 199
Fedotov, V. S., 269
Feĭginson, N. I., 196
Fernández, O., 258
Ferrand, M., 418
[Fielding, W. L.], 321
Filho, A. Caminha, see Caminha Filho, A.
Filho, J. Ribeiro, see Ribeiro Filho, J.
Fineman, Z. M., 290
Firsova, M. A., 221
Fischer, G. W., 244
Fischer, L., 98
Fisher, R. A., 109
Fjaervoll, K., 219
Flory, W. S. (jun.), 443
Flovik, K., 82, 278
Foss, H., 281
Foster, C. B., 355–56
Foster, H. H., 276
Fransen, J. J., 130
Frenkelj, A. I., 147
Fyfe, J. L., 47

Gagnieu, A., 438
Gaines, J. C., 335
Galet, P., 490
Gamaleja, N. F., 114
Gaskill, J. O., 360
Gates, R. R., p. 177
[Gay, H.], 38–39
Generalov, G. F., 583
George, W., 62
Gerritsen, J. D., 433
Gibbs, R. D., 112
Giles, N. H. (jun.), 117
Ginneken, P. J. H. van, 272
Glaerum, O., 163
Glenn, E. M., 462
Gluščenko, I. E., 548
Godunova, K. N., 154
Goes, L. A. de Almeida, 124
Golubinskiĭ, I. N., 108
Gonçalves, A. P., 226
Goodall, D. W., 136
Goodspeed, T. H., 382
Gourlay, W. B., 64
Gračeva, N. P. 115
Grafius, J. E., 187
Graves, A. H., 505
Gray, L. H., 68
Greenway, P. J., 510
Gregory, F. G., 136, 214
Grieben, H., 405
[Griško, N. N.], 337
Guinier, P., 501, p. 185
Gustafsson, Å., 104
Guthrie, J. D., 474
Györffy, B. Y., 338

Haan, H. de, 318
Haase-Bessell, G., 74
Hahn, G. G., 519
Haigh, J. C., 303
Hamilton, D. G., 195
Hansen, H. H. H., 191
Haralson, F. E., 440
[Harper, A. S.], 321
Harris, M. R., 313
Harris, R. H., 174
Harris, R. V., 479
Hart, R., 445
Hastings, W. R., 559
Hatton, R. G., 462
Hayes, H. K., p. 176
Hédin, L., 240
Hedrick, U. P., p. 184
Heiser, C. B. (jun.), 415
Henderson, R. W., 372
Heuts, M. J., 93
Higginbottom, C., 118
Hinrichs, H., 467
Hitier, H., 383, 529
Hodge, W. H., 131, 456
Hoffman, I. C., 547
Hoffman, J. G., 92
Hoffpauir, C. L., 474
Holmberg, C., 306
Holton, C. S., 184
Horne, F. R., 139
Houlahan, M. B., 123
[Hoyle, S. T.], 321
Hsu, W. Y., 218
Hubbeling, N., 561
Hughes, H. D., 266
Hugues, P., 571
Hungerford, C. W., 555
Hutchins, M. C., 572
Hutchinson, J. B., 324, p. 183
Hvatova, K. A., 576
Hylmö, B., 523–24, 532

Iljenko, G. T., 164
Iltis, H. H., 54
Immer, F. R., p. 176
Isaac, W. E., 558
Ivančenko, P. L., 551
Ivimey Cook, W. R., p. 180

Jacob, K. C., 485
Jackobs, J. A., 268
Jakubciner, M. M., 177
Jakuškin, I. V., 337
James, E., 2
[Jameson, J. D.], 321
Jeffrey, E. C., 90
Jenkins, M. T., 200–01, 209
Jodon, N. E., 232
Johansson, E., 437
Johnson, J., 142
Jonard, P., 149
Jones, T. H., 451
Jones, E. M. Marsden-, see Marsden-Jones, E. M.
Jucci, C., 42
Junior R., Briquet, see Briquet Junior R.

Kalton, R. R., 570
[Kaniskin, N. F.], 337
Kárpáti, Z., 447, 506
Karper, R. E., 247
[Kaufmann, B. P.], 38–39
Kavanau, J. L., 79
Kerle, W. D., 566
Keyworth, W. G., 392
Kiellander, C. L., 513
Kihara, H., 95
[King, H. E.], 321
Kirpičnikov, V. S., 70
Kirpichnikov, see Kirpičnikov
Kishen, K., 5 [11]
Klinkowski, M., 251
[Knight, R. L.], 321
Knowles, W. H. C., 349, 357
Knutsson, G., 151
Koblet, R., 25
Koch, L., 567
Köhler, E., 311
Kokolios, B., 148
Kornilov, A. A., 170
[Koshal, R. S.], 11
Kosswig, C., 561
Kotval, J. P., 68
Kovalevskiĭ, L. I., 156
Kreizinger, E. J., 244
Krogh, C. von, 72
Kronenberg, H. G., 483
Krug, C.A., 387–88
Kugler, W. F., 340
Kuljčickaja, Z. A., 167
Kung, P., 227, 231
Kürçay, A., 391
Kuzjmin, V. P., 20
Kwan, S. K., 230

Laan, E. van der, 10
Lamas, P. J. A., 405
Lamm, R., 523–24
Langham, D. G., 403–04
Laptev, I., 48
Larose, E., 24
[Latarjet, R.], 39
Lathbury, R. J., 158
Laubscher, F. X., 28
Laumont, P., 385, 527
Lavallard, M. L., 213
Lavallée, E., 560
Law, A. G., 244
Leblond, D., 152
[LeClerc, G.], 38
Lecrenier, A., 429
Lefèvre, J., 97
Lehman, S. G., 574
Leonard, W. H., 210
Levadoux, L., 492
Lewis, D., 103
Lewis, J., 49
Lewis, M. T., 535
Lin, K., 411
Lindegren, C. C., 119, 125–26
Lindegren, G., 125
Lindquist, B., 507, 514
Linland, D., 271
Linsley E. G., 256–57
Linton, R. D., 294
Loo, T. Y., 229
Lord, E., 330
Lott, T. B., 449
Louis-Marie, P., 58, 65, 249–50
Luna, J. T., 202
[Luria, S. E.], 38, 39
Lysenko, T. D., 77

[McClintock, B.], 38, 39
MacDaniels, L. H., 459, 465
MacDermott, N., 315
[MacDonald, D.], 321
[McDonald, M. R.], 39
McKay, J. W., 460
McKinney, H. H., 189
[McKinstry, A. H.], 321
McLean, R. G., p. 108
MacSwain, J. W., 256–57
MacVickar, M. H., 206
[Madhava, K. B.], 11
Magruder, R., 563–64
Maheshwari, P., 107
Malheiros, N., 86
Maliga, P., 461
Maljuta, D. I., 167
Maltais, J. B., 580–81
Maneiro, R. V., 159
Mangelsdorf, A. J., 346
[Manin, V. V.], 337
Margarido Correia, E., see Correia, E. Margarido
Marie, P. Louis-, see Louis-Marie, P.
Marino, A. E., 202, p. 176
Marques de Almeida, C. R., see Almeida, C. R. Marques de
Marsden-Jones, E. M., 55
Martin, V. C., 109
Martins, R. G., 6
Mason, H. L., 110
Mauri, N., 452–53
Mayer, L. S., 209
Mayer, R., 149, 571
[Medvedev, P. F.], 337
Mendes, L. O. T., 424–25
Mendes da Costa e Sousa, L. de O., see Sousa, L. de O. Mendes da Costa e
Mendonça, P. de Varennes e, 7
Meunier, G., p. 185
Michiels, A., 376
Millán, R., 293
Miller, O. H., 98
[Miller, W. L.], 321
Millington, A. J., 193
Mirimanoff, A., 419
[Mitchell, B. L.], 321
Mitchell, H. K., 122–23
Mitra, J., 84
Moh, P. C., 223
Monachino, J., 428
Moore, R. C., 436
Moreau, R. E., 285
Morse, W. J., 565
Morton, J., p. 184
Morton, K., p. 184
Moscoso, R. M., p. 181
Mouat, H. M., 457
Moyer, R. T., 15
Müller, K. O., 287, 307
Munson, E. P., 341
Murphy, A. M., 375
Murthi, S. N., 420
Myers, W. M., 237

Naesvold, V., 134
Naithani, S. P., 538
[Nanton, W. R. E.], 321
[Nevinnyh, V. A.], 337
Newcomer, E. H., 504
Nichols, J. E., 234
Nielsen, E. L., 241, 248, 286
Nikitina, I. L., 337
Nissen, Ø., 8
Nizenjkov, N. P., 113
Noggle, G. R., 197
Nott, J., 393
Nye, J. F., 122

[Oakberg, E. F.], 39
Ošev, A., 550
Owen, F. V., 375
Ozbek, S., 435
Ozirskiĭ, V. I., 394

P. . . . . , V. G., 334
Pal, B. P., 133
Paljčevskiĭ, V. I., 542
Pan, C. L., 231
[Panse, V. G.], 11
Parenti, E., 208
[Peat, J. E.], 321
Peñasco, F. S. de Sopranis y, see Sopranis y Peñasco, F. S. de
[Pendharkar, V. G.], 11
Pereira, C., 67
[Pereverzev, G. A.], 337
Perrault, C., 171
Perronne, P., 520, 544
Pesola, V. A., 21
Petrov, I. P., 161
Phillippe, P. M., 206
Phillips, M. E., p. 179
Phillis, E., 475
Plotnikov, N. Ja., 220
Poehlman, J. M., 194
Pontecorvo, G., 118
Popowski, A., p. 177
Popp, W., 185
Porter, C. L., 246
Porter, D. R., 545
Portères, R., 295
Pound, G. S., 533
Powers, L., 371
Puri, G. S., 499, 509
Purushottam Das, 538
Purvis, O. N., 214
Pushkarnath, 289

Quantz, L., 439
Quinby, J. R., 247

Ragulin, A. A., 166
Ramanujam, S., 399
[Ramdas, L. A.], 11
[Ramiah, K.], 11
[Ranjan, S.], 11
Rao, N., Satyanarayana, see Satyanarayana Rao, N.
Rassmussen, F. K., 317
Rasmussen, K. L., 274
Raut, C., 119, 126
Read, J., 89
Reed, C. A., 468–69
Reeves, R. G., p. 181
Regnier, R., p. 185
Ribeiro Filho, J., 378
Richter, H., 251
Rick, C. M., 553
Rickett, H. W., 111, p. 182
Ridley, H. N., 66
Riker, A. J., 498
Rivero, A. Rodriguez del, see Rodriguez del Rivero, A.
Rjabov, I. E., 225
Roberts, F. M., 128
Robertson, J. G., 143
Rodde, A., 385
Rodenhiser, H. A., 184
Rodriguez del Rivero, A., 178
Rogers, H. T., 264
Rollin, L., 385
[Rose, M. F.], 321
Rosen, G. von, 85
Rosen, H. R., 182
Rouleau, E., 502
Rousseau, J., 71
Roy, K. B., 265
Rozendaal, A., 310
Ryser, G. K., 375
Ryžeĭ, I. P., 179

S. . . . . , P., 476
Saeger, H. de, 326
[Sahasrabudhe, V. B.], 11
Šahov, A. A., 238–39
Saltroe, Thv., 153
Salzmann, R., 314
Samuel, L. W., 193
Sankaran, R., 323
Sansom, C. H., 536
Sarasola, J. A., 217
Satyanarayana Rao, N., 380
Saunders, A. R., 28
Sax, H. J., 511
Sax, K., 511
Ščerbak, S. N., 417
Schad, C., 571
Schmidt, M., 432
Schnarf, K., 137
Schwanitz, F., 80
Scully, N. J., 398
Sedlmayr, K. A., 361
Sekun, P. F., 157
[Sen, A. R.], 11
Šendereckiĭ, E. I., 556
Sharp, A. J., 518
Sherry, S. P., 512
Shih, C. Y., 573
Sibbitt, L. D., 174
Sievers, A. F., 397
Sikka, S. M., 325
Silberschmidt, K., 284
Silow, R. A., p. 183
Simon, M., 367, 376
Simonneau, R., 453
Simpson, D. M., 329
Sirks, M. J., 50
[Sizov, I. A.], 357
Skuderna, A. W., 359
Slatensek, J. M., 267
Sløgedal, H., 279
Slogteren, E. van, 129
Smith, A. L., 333
Smith, H. P., 331
Smith, T. E., 384
Sobrinho, J. de Vasconcelos, see Vasconcelos Sobrinho, J. de
Sopranis y Peñasco, F. S. de, 175
Sousa, L. de O. Mendes da Costa e, 489, 491

Sprague, G. F., 199
Stahmann, M. A., 120
Stapledon, R. G., 236
Stapp, C., 300
Stauffer, J. F., 120
Stephens, J. C., 222
Stephens, S. G. [39], p. 183
Steuk, W. K., 488
Stevenson, F. J., 301
Stewart, D., 360, 363, 368
Stewart, E. H., 264
Stockar, A., 407–08
Störmer, K., 283
Stuivenberg, J. H. M. van, 106
Subramaniam, M. K., 91
Sukhatme, P. V., 9 [11]
Sun, P. C., 275, 401–02
Sundelin, G., 180
Swanson, C. P., 87
Swenson, S. P., 187

Tai, S. N., 183, 400
Tansley, A. G., p. 180
Tapley, W. T., 562
Tatum, W. G., 464
Tavcar, A., 203
Teigland, J., 153, 298
Tekeli, S. T., 215
Ter-Avanesjan, D. V., 327
Teterev, F. K., 442
[Thawani, V. D.], 11
Thoday, J. M., 89
Thomas, D. C., 308
Thomas, I., 193
Thomas, W. D. (jun.), 299
Thomson, R. B., 517
Thorold, C. A., 389
Thung, T. H., 302
Ting, T. L., 568
Totmakov, G. V., 546
Trautmann, R., 584
Trofimova, A. N., 260
Tsai, H., 186
Tsitsin, see Cicin
Tsvetoukhine, 316
Tu, T. S., 230
Tulasne, R., 116
Turrill, W. B., 55
Tysdal, H. M., 253–54

Ullstrup, A. J., 207
Unrau, J., 413
Uven, M. J. van, 14

Vallega, J., 217
Vanderwaeren, J., 367
Van der Werff, J. Th., p. 176
Van Goidsenhoven, W., 367
Varennes e Mendonça, P. de, see Mendonça, P. de Varennes e
Vasconcelos Sobrinho, J. de, 135
Vasconcellos, J. de Carvalho e, 493
Veenbaas, M. A., 292
Vendrely, R., 116
Vestergaard, H. A. B., 192
Vinogradova, E. I., 172
Virta, A. A., 531
Volp, P., 352
Vydrin, V. I., 414

W....., T. A., 578
Wagner, J., 508
Walton, R. R., 543
Wang, W. J., 183
[Warmke, H. E.], 38
Wauthy, R., 376
Weatherby, C. A., 111
[Weatherley, P. E.], 321
Weber, C. R., 570
Webster, C. C., 409–10
Wei, T. C., 218
Weimer, J. L., 579
Weiss, M. G., 570
Wellensiek, S. J., 169
[Wells, W. G.], 321
Werth, E., 78
Weschcke, C., 470
Wester, R. E., 563, 564
Whaley, W. G., 426
Whitaker, T. W., 541
White, E. C., 481
Wiehe, P. O., 353
Wiersema, H. T., 288
Wiklund, O., 364
Wilcox, M. S., 572
Williams, C. H. B., 357
Wilsie, C. P., 266
Wilson, M. C. (jun.), 259
Wimmer, G., 377
Winch, N. H., 558
[Witkin, E. M.], 39
Witkus, E. R., 96
Witt, A. W., 462
Wood, R. R., 366
Woods, A. F., 127
Woods, M. W., 127
Woodward, R. W., 184
Work, P., 537
Woudenberg, J. P. M., 146

Yamaha, G., 88
Yamazaki, M., 343
Yates, F., 3
Young, R. E., 526

Zapparoli, T. V., 204–05, 208
Zarger, T. G., 466
Zimmermann, W., 75, 81
Zvereva, P. A., 296
Zvezdkina, A. S., 263
Zweede, A. K., 522

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